ENGINEERING NEWS-RECORD

OCTOBER 3, 1946

Construction of digestion tanks constitutes a major step toward completion of new Toronto sewage treatment plant.

TRAINING SKILLED HELP FOR CONSTRUCTION

VENTS MINIMIZE EXPLOSION DAMAGE

DETERMINING SURFACE PROFILES IN CHANNELS

BYERS WROUGHT IRON does "Guard Duty" on this FILTER PLANT SUPPLY LINE

Water is an essential processing material in a paper mill, and both the dependability and the purity of the supply must be carefully safeguarded. A well-known Wisconsin paper company followed a time-proven method when they installed a 36-inch OD pipe to carry raw water to the filter plant, using Byers Wrought Iron. The pipe was fabricated from Byers Wrought Iron plates by James G. Heggie Manufacturing Company.

There is plenty of engineering evidence, from various sections of the country, to support this choice of material. In Pennsylvania, a 50-inch water line is still in service and operating under 135 pounds pressure, after a period estimated at from 60 to 79 years, and only one leak has ever been reported. In California a 200-foot length of 44-inch OD wrought iron line was removed after 54 years service. It was in such good condition that it was placed in stock for making replacements. These are only two of many remarkable records that have been reported.

Wrought iron's durability and dependability in services like these is due to its unusual structure and composition, which are duplicated by no other material. Tiny fibers of glass-like silicate slag, 200,000 or more to the square inch of section, are threaded through the main body of high purity iron. These fibers act like baffles, in halting and dispersing corrosive attack, and so discouraging pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

A number of historic water lines, and a number of modern installations, are illustrated and described in our bulletin, "Wrought Iron for Underground Services." If you would like a copy, just write.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Seattle, San Francisco.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE ALLOY STEELS · OPEN HEARTH ALLOY STEELS
CARBON STEEL TUBULAR PRODUCTS

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewerage, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Airports, Irrigation, Canals, Tunnels, Railroads

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October 3,1946

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The index for Volume 136 (January to June 1946) will be mailed without further request to all those who ordered an index for Volume 135. Subscribers who wish the index and who did not receive the Volume 135 index or who have since changed their address should return this coupon.

The Editor, Engineering News-Record
330 West 42nd St., New York 18, N. Y.

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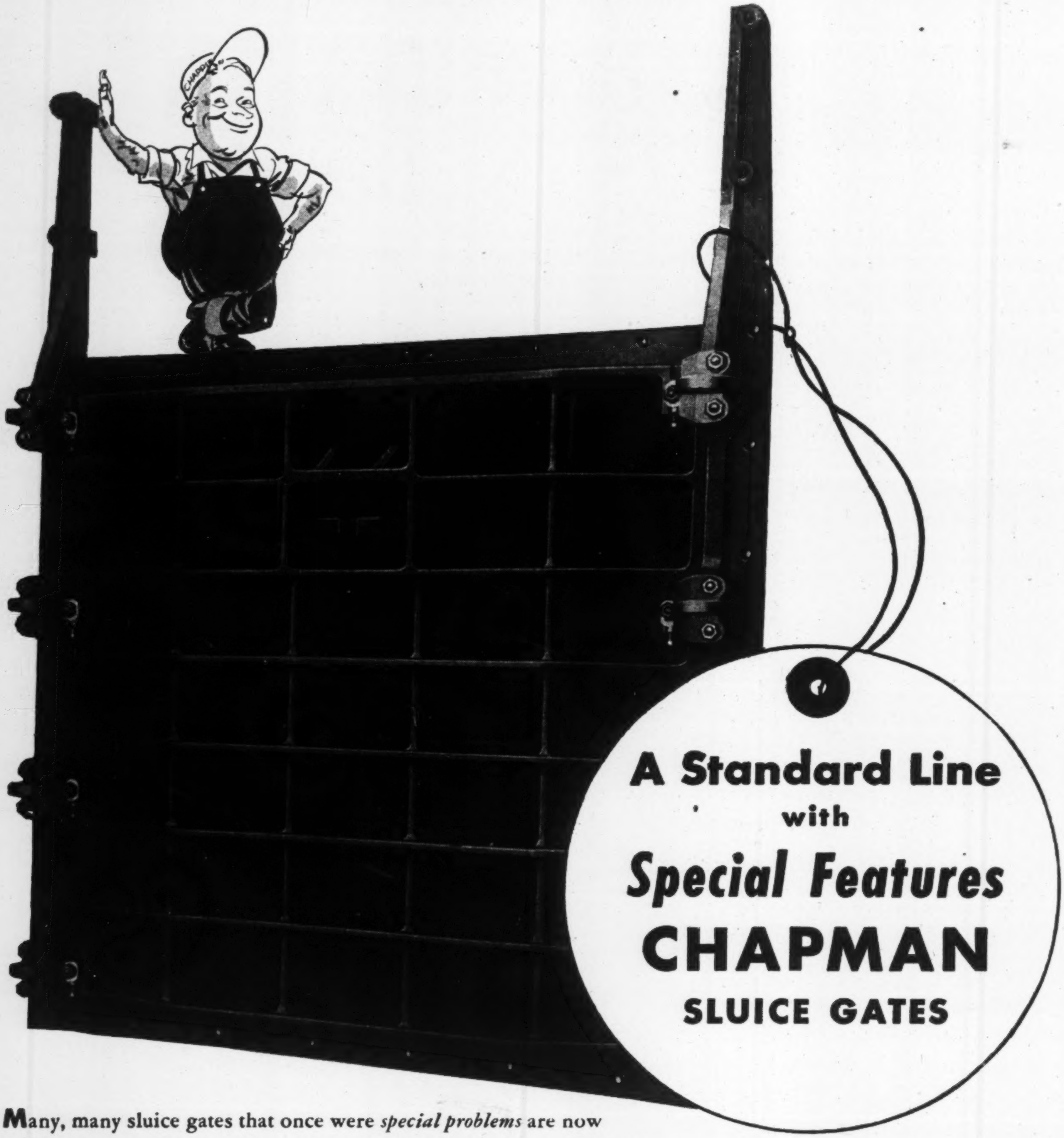

Many, many sluice gates that once were *special problems* are now in the Chapman *Standard* Line. So, before going to any unnecessary expense in ordering special equipment, be sure first to see what Chapman offers.

And remember, too, Chapman Sluice Gates are simple to install—their interchangeable stems and couplings require no match-marking.

Chapman Sluice Gates may be obtained with any type of operating control—manual, hydraulic cylinder or motor unit.

Send for a copy of Chapman's Sluice Gate Handbook for complete information.

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INDIAN ORCHARD, MASSACHUSETTS

Construction Trends

1946 a Record Year for Earthwork, Irrigation, and Drainage Construction

Earthwork, irrigation, and drainage contracts awarded during the first eight months of 1946, totalling $290,137,000, have already topped by 8 percent the previous all-time 12-month record high of $268,000,000 recorded by *Engineering News-Record* in 1938. Federal projects in the amount of $274,690,000 account for 95 percent of the 1946 earthwork and drainage contracts, while the remaining 5 percent, $15,447,000, is for state, district, county and municipal work.

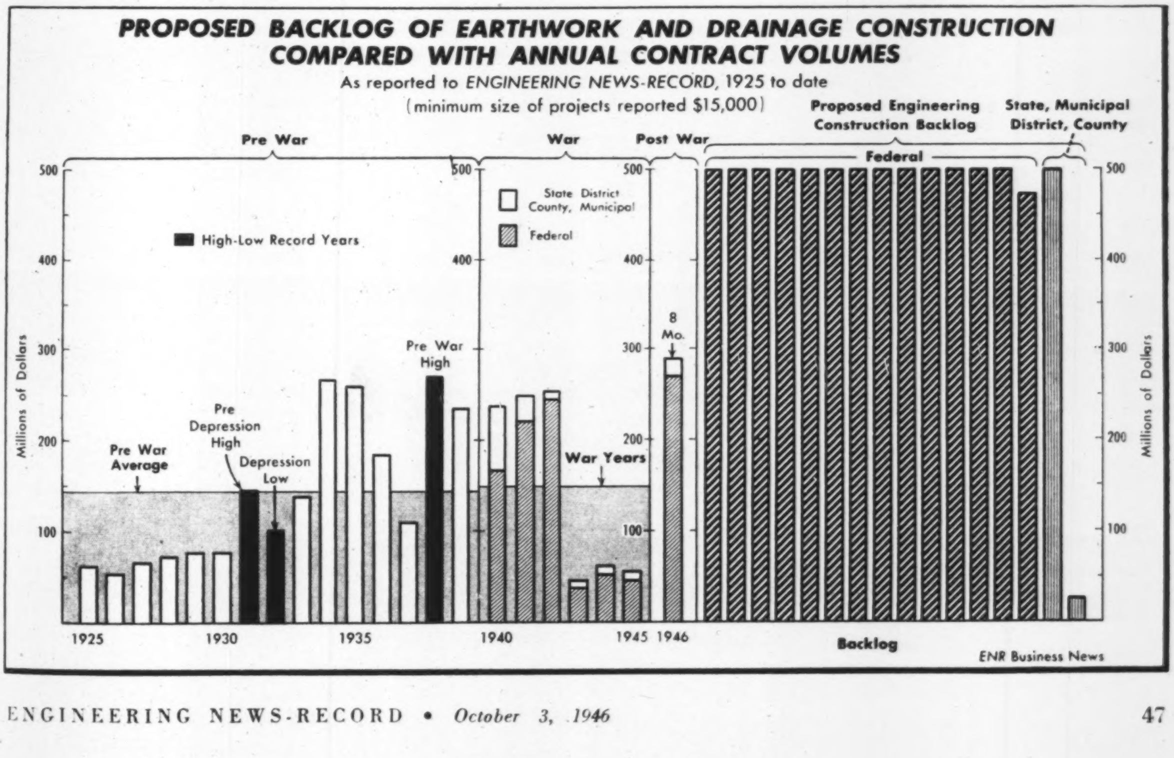
Earthwork and drainage construction, which includes dams, flood control projects, river and harbor improvements, hydro-electric facilities and other reclamation work, averaged $10,004,724 per week in 1946. This is 94 percent above the weekly average construction of $5,153,845 in 1938, and 816 percent above the weekly average of $1,091,519 in 1945.

Some of the larger contracts, in order of approximate size, which have been awarded this year are: Bull Shoals Dam, Arkansas, $24,000,000; Davis Dam, Arizona-Nevada, $21,000,000; Wolf Creek Dam, Kentucky, $18,000,000; Allatoona Dam, Georgia, $13,000,000; Fort Gibson Dam, Oklahoma, $12,000,000; Detached Breakwater, Los Angeles and Long Beach Harbors, California, $7,000,000; Granby Dam, Colorado, $6,000,000; Flood Control Dam, Fall River Project, Oklahoma, $6,000,000; Horsetooth Dam, Satanka Dike and Soldier Canyon, Colorado, Canton Dam, Oklahoma, and Kortes Dam, Missouri Basin Project, Wyoming, all $5,000,000.

The backlog of proposed work at the end of August, 1946 totalled $7,497,369,000; $6,971,011,000, or 93 percent for federal projects, and $526,358,000, or 7 percent for state, district, county and municipal work. This backlog currently exceeds those of all other classes of construction. Even if this year's all-time record rate of earthwork and drainage construction were maintained, the huge backlog alone could supply 17 years of work.

The Western areas are slated for 77 percent of the proposed earthwork, irrigation and drainage construction. The country-wide subdivision of proposed construction is: West of Mississippi, 41 percent; Far West, 36 percent; Southern, 12 percent; Middle Atlantic, 5 percent; Middle West, 4 percent; and New England, 2 percent.

Since August 6, 1946, when the moratorium on federal construction was imposed by the OWMR, the weekly average of earthwork and drainage contracts has been only $1,389,000, compared to the eight-months weekly average of $10,004,724. Contract awards are expected to remain in this state of suspension at least until October 1, 1946, the scheduled date for lifting restrictions on federal "non-deferrable" construction. April 1, 1947 is the anticipated date of moratorium release for federal construction in the "less urgent" classifications.



PROPOSED BACKLOG OF EARTHWORK AND DRAINAGE CONSTRUCTION COMPARED WITH ANNUAL CONTRACT VOLUMES

As reported to *ENGINEERING NEWS-RECORD*, 1925 to date

(minimum size of projects reported $15,000)

ENR Business News

NORDSTROM *lubricated* VALVES

Nordstrom Valves controlling sludge lines in Greater Greenville, S. C. plant.

keep UPKEEP *down*

...The NORDSTROM Way

These Advantages Spell Economy

QUARTER TURN
Quick to operate. Valve position apparent at a glance.

SIMPLEST DESIGN
Few parts. Nothing to trap line contents.

"SEALDPORT" LUBRICATION
Coats and protects working parts from corrosion, erosion.

FULL FLOATING PLUG
Always easy to turn. Non-freezing. Non-sticking.

LAPPED PLUGS
Precision lapped by exclusive process for exact fit.

NO EXPOSED SEAT
Plug rides on pressure sealed lubricant.

NON-STICKING
Hydraulic action lifts and frees plug.

COMPACT
No protruding stems or yokes. Occupy minimum space.

"NORDCOSEAL" LUBRICANTS
Special plastic lubricants for all services.

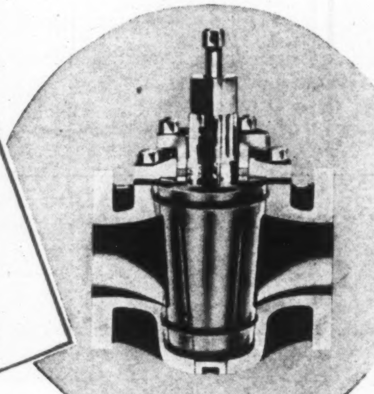
Out-Wear, Out-Perform

Other Types on Sewage Disposal Services

In sewage treatment plants from Maine to California, Nordstrom Valves have established amazing service records that prove their economy. They are simple, positive, enduring. Use them on *any* service — sludge, gas, air, acids and caustics, water. They turn quickly and easily, last indefinitely and always maintain a bottle-tight line.

An interconnecting system of grooves in plug and body transmits lubricant under pressure to seal the ports, lubricate the working surfaces and hydraulically jack the plug free for ever-ready operation.

Ask for Bulletin



Nordstrom
LUBRICATED FOR ALL PURPOSE SERVICE **VALVES**
Sealdport Lubrication

NORDSTROM VALVE COMPANY Division of Rockwell Manufacturing Co.
Pittsburgh 8, Pa.

ROCKWELL NORDSTROM

New Construction Volume in October

Civil engineering construction volume in continental United States totals $373,056,000 for September, an average of $93,264,000 for each of the four weeks of the month. This average is 14 percent below the average for August, and is 59 percent above the average of September, 1945 according to *Engineering News-Record.*

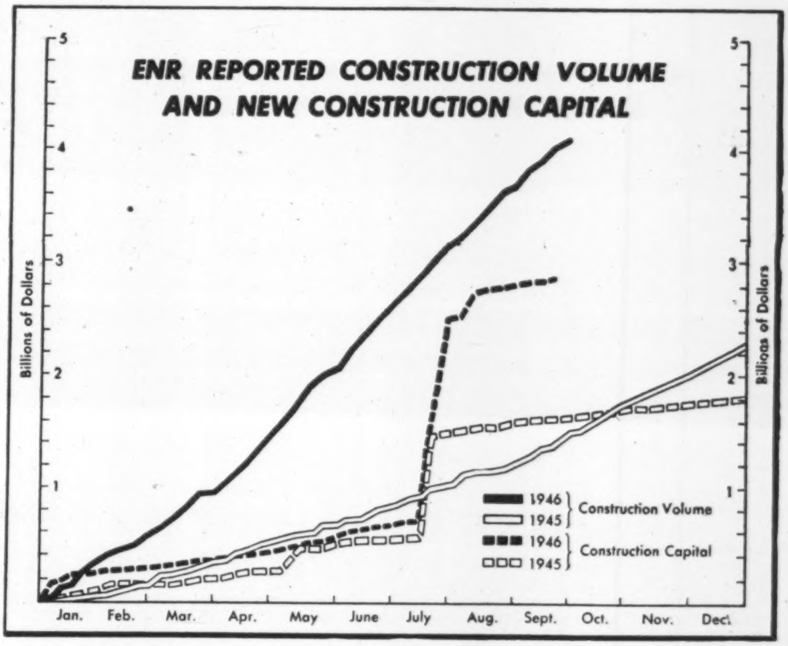
Private construction for September on a weekly average basis is 15 percent below last month, but 37 percent greater than September, 1945. Public construction is 11 percent below last month and 113 percent above last September. State and municipal construction, while 8 percent below last month, is 197 percent above the average for September, 1945. Federal construction, down 23 percent from last month, is 8 percent below September, 1945.

Weekly averages in the various classes of construction for September, 1946 compared with August, show gains in industrial buildings of 35 percent; sewerage, 20 percent; private bridges, 688 percent; earthwork and drainage, 44 percent; and private unclassified, 313 percent; losses in highways, 20 percent; public buildings, 20 percent; commercial buildings, 52 percent; public bridges, 22 percent; waterworks, 12 percent; and public unclassified, 15 percent.

Geographically, three sections show gains in September, 1946 over August—South, 6 percent; Middle West, 53 percent; and West of Mississippi, 18 percent. New England dropped 18 percent below August, Middle Atlantic, 52 percent, and Far West, 19 percent.

Four sections made gains in September over September, 1945—New England, 301 percent; South, 305 percent; West of Mississippi, 88 percent; and Far West, 94 percent. Middle Atlantic dropped 3 percent below last year, and Middle West, 4 percent.

Final figures on new construction capital are not available. Due to the truck strike and resultant paper shortage, sale of state and municipal bonds and corporate securities have not yet been published for the last week of September.



ENGINEERING CONSTRUCTION CONTRACTS REPORTED TO ENGINEERING NEWS-RECORD—SEPTEMBER, 1946

Engineering News-Record *reports continental U. S. Construction projects of the following minimum costs — Waterworks, excavation, drainage and irrigation,* $22,500 *other public works,* $40,000; *industrial buildings,* $55,000; *other buildings,* $205,000
Five Weeks — Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States September	United States Nine Months 1946	United States Nine Months 1945	Canada
Public Works										
Waterworks	187	742	3,793	1,134	2,560	692	9,108	78,407	40,344	446
Sewerage	2,091	577	479	1,280	2,749	2,406	9,582	77,379	24,213	519
Bridges, public	167	5,065	1,619	1,124	1,470	1,631	11,076	103,200	22,082	245
Earthwork and waterways	62	445	18,531	247	1,803	1,511	22,599	312,736	38,301	173
Streets and roads	3,853	9,507	14,183	10,172	17,502	4,183	59,400	602,002	168,804	1,620
Buildings, public	7,311	3,858	3,372	3,780	3,586	3,855	25,762	293,565	413,548	3,168
Unclassified, public	470	2,943	286	933	1,021	254	5,907	131,677	227,198	212
Total public	14,141	23,137	42,263	18,670	30,691	14,532	143,434	1,598,966	934,490	6,383
Federal government (incl. in above classifications)	....	505	18,262	....	2,855	3,746	25,368	66,602	675,908	....
Private										
Bridges, private	....	250	....	....	....	....	250	1,761	3,806	....
Industrial buildings	4,659	5,685	32,184	32,994	22,217	6,260	103,999	797,516	362,097	12,555
Commercial buildings	8,423	39,484	10,281	13,231	6,170	11,529	89,118	1,520,497	129,560	5,645
Unclassified, public	40	310	5,350	2,087	7,742	20,726	36,255	164,421	66,301	50
Total private	13,122	45,729	47,815	48,312	36,129	38,515	229,622	2,484,195	561,764	18,250
Total Engineering Construction:										
September, 1946 — 4 weeks	27,263	68,866	90,078	66,982	66,820	53,047	373,056	....	....	24,633
August, 1946 — 5 weeks	41,616	180,838	105,766	54,606	70,625	87,874	541,325	....	....	32,281
September, 1945 — 4 weeks	6,801	71,197	22,225	70,048	35,525	29,359	235,135	....	....	18,226
Nine Months — 1946	244,201	957,999	615,343	488,316	818,211	959,091	....	4,083,161	....	249,246
Nine Months — 1945	65,501	253,635	236,871	268,056	314,501	357,690	....	....	1,496,254	117,022

Brother, can you spare a beam?

Steel is like money. When you need it, you need it *badly*. That's why we have many steel plants to give next-door service most anywhere.

But lately it's getting so we hesitate to open the mail or answer the phone. We *know* there will be friends asking for steel—steel they need badly—and often we just are not able to fill the bill.

And here's what's causing it all

For a while it looked as though production would soon catch up with demand. Now that time seems more distant. The many things holding up top steel production have been slow to clear away. Unpredictable stoppages keep popping up, and shortages have brought other delays. You know about many of them. We've been doing our best, but for reasons beyond our control, we're still getting orders we can't fill.

But remember this:

One of these years the steel situation is going to change for the better. When that happens our plants will be among the first to stock products now hard to get and we'll burn up the roads rushing your steel to you. In preparation for that day, we're improving and expanding facilities, to protect the quality of Ryerson steel and ship it to you faster.

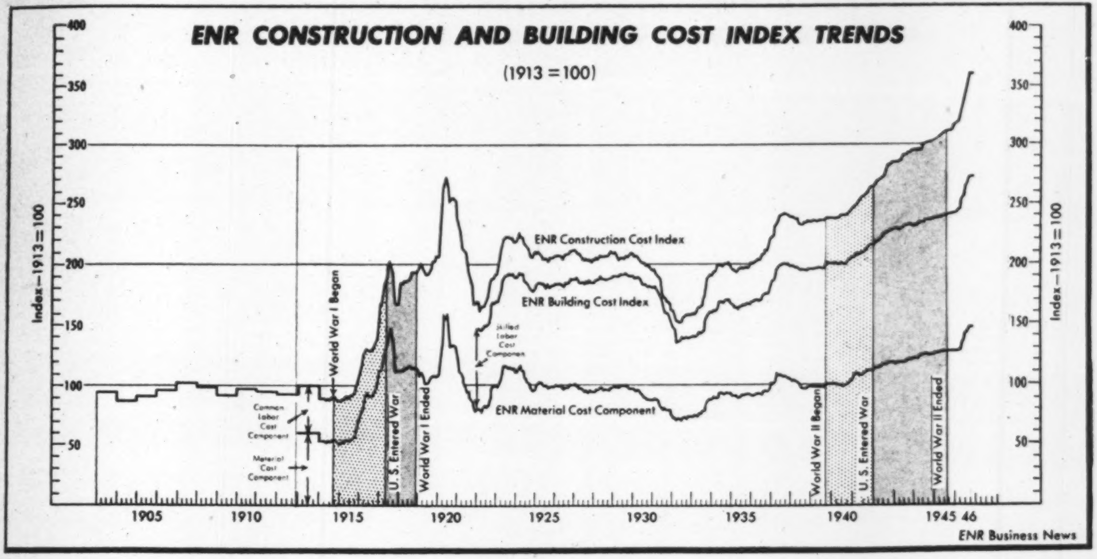
We are even now building a new plant and adding extensively to equipment at 11 others.

Meanwhile, the steel you need or a practical alternate may be in stock. So contact the nearest Ryerson plant with the full knowledge that we will do everything in our power to work with you.

JOSEPH T. RYERSON & SON, Inc., Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston

RYERSON STEEL

OCTOBER CONSTRUCTION BUSINESS REPORT


ENR CONSTRUCTION AND BUILDING COST INDEX TRENDS

(1913 = 100)

ENR Business News

ENR CONSTRUCTION VOLUME AND NEW PRODUCTIVE CAPITAL

Thousands of Dollars (,000 omitted)	September 1945 (4 wk.)	September 1946 (4 wk.)	% Change	Nine Months 1945 (39 wk.)	Nine Months 1946 (39 wk.)	% Change
Total U. S. Construction	$235,155	$373,056	+59	$1,496,254	$4,083,161	+173
Private Construction	167,853	229,622	+37	561,764	2,484,195	+342
Public Construction	67,302	143,434	+113	934,490	1,598,966	+71
Federal	27,600	25,368	−8	675,908	540,117	−20
E N R Construction Volume Index, 1913 = 100	164	223	+36	102	266	+161
Total New Productive Capital	$47,473	Final figures		$1,649,236	Final figures	
Private Investment	47,473	not available		435,738	not available	
Federal (non-federal work)	....	....	......	163,600	225,000	+38
Federal (federal work)	....	....	......	1,049,898	1,374,866	+31

*Paper shortage, due to truck strike, delayed issuance of private investment publications.

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Oct., 1946	360.94	173.50	272.74	147.43	...	...
Sept., 1946	360.19	173.14	272.04	147.06	223	98
Aug., 1946	361.37	173.71	271.98	147.02	258	113
July, 1946	353.89	170.11	266.13	143.86	327	144
June, 1946	347.91	167.24	264.16	142.80	344	151
May, 1946	339.69	163.29	257.25	139.06	284	125
April, 1946	334.59	160.83	254.37	137.50	340	149
Mar., 1946	323.83	155.66	245.41	132.66	256	112
Feb., 1946	319.52	153.59	243.94	131.86	167	73
Jan., 1946	316.32	152.05	242.23	130.94	189	83
Dec., 1945	313.48	150.69	240.82	130.18	163	71
Nov., 1945	309.28	148.67	240.55	130.00	173	76
Oct., 1945	309.28	148.67	240.35	129.93	167	73
Sept., 1945	309.28	148.67	240.07	129.77	164	72
1945 (Av.)	307.74	147.93	239.14	129.27	123	54
1944 (Av.)	298.63	143.39	234.73	126.89	95	42
1943 (Av.)	289.95	139.38	228.75	123.66	176	77
1942 (Av.)	276.31	132.82	222.39	120.22	553	243

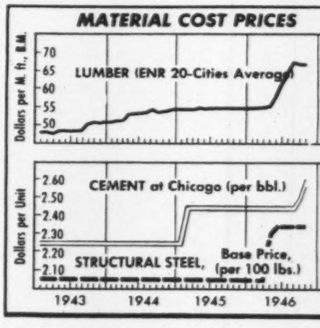
CONSTRUCTION COST . . . WAGE RATES . . . MATERIAL PRICES

1913 = 100	October 1945	October 1946	% Change	Change September to October 1945 Sept.	1945 Oct.	%	1946 Sept.	1946 Oct.	%
E N R Constr. Cost Index†	309.28	360.94	+16.70	309.28	309.28	0	360.19	360.94	+0.21
E N R Building Cost Index†	240.35	272.74	+13.48	240.07	240.35	+0.1	272.04	272.74	+0.26

† *Does not reflect increased costs due to overtime, lower labor efficiency, delivery delays, etc.*

ENR 20-CITIES' AVERAGE

	October 1945	October 1946	% Change	1945 Sept.	1945 Oct.	%	1946 Sept.	1946 Oct.	%
Common Labor	$0.917	$1.073	+17.01	$0.917	$0.917	0	$1.072	$1.073	+0.09
Skilled Labor (Av.3 Trades)	1.674	1.847	+10.33	1.670	1.674	+0.2	1.846	1.847	+0.05
Bricklayers	1.770	1.962	+10.85	1.770	1.770	0	1.962	1.962	0
Structural Ironworkers	1.727	1.860	+7.70	1.720	1.727	+0.4	1.860	1.860	0
Carpenters	1.525	1.725	+13.11	1.519	1.525	+0.4	1.724	1.725	+0.06
Cement, per barrel	2.76	3.106	+12.54	2.750	2.760	+0.4	2.909	3.106	+6.77
Reinforcing Steel, cwt	2.79	3.370	+20.79	2.790	2.790	0	3.370	3.370	0
Structural Steel, base	2.10	2.35	+11.90	2.10	2.10	0	2.350	2.350	0
Sand, per ton	1.24	1.501	+21.05	1.24	1.24	0	1.501	1.501	0
Lumber, 2x4 Fir, per M ft.	55.63	69.780	+25.44	55.63	55.63	0	69.947	69.780	−0.24
Lumber, 2x4 Pine, per M ft.	53.84	63.418	+17.79	53.84	53.84	0	63.418	63.418	0
Common brick, per M	19.08	22.225	+16.48	18.98	19.08	+0.5	22.055	22.225	+0.77
Ready-mixed concrete, c.y.	7.63	8.315	+8.98	7.62	7.63	+0.1	8.283	8.315	+0.39
Struct. clay tile, 3x12x12	85.07	98.232	+15.47	85.07	85.07	0	98.232	98.232	0


MATERIAL COST PRICES

MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	September 1945	September 1946	% Change	August 1946	% Change August to September
Steel (% operating Capacity) A.I.S.I.	80.5	88.1§	+9	89.6	−2

	July 1945	July 1946	% Change	Seven Months 1945	Seven Months 1946	% Change
Cement, thous. bbl. U.S.B. of Mines	10,283	16,250	+58	53,965	90,211	+67

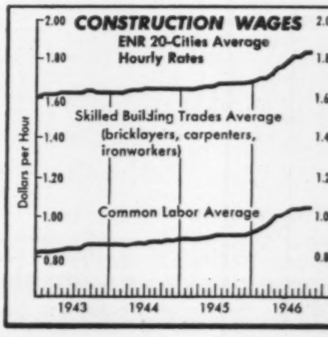
	August 1945	August 1946	% Change	Eight Months 1945	Eight Months 1946	% Change
Fabricated Structural Steel, tons, A.I.S.C.	53,207	145,137	+173	458,238	924,953	+102
Building Permits, 215 Cities, Dun & Bradstreet (,000 Omitted)	$113,540	$203,565	+79	$607,296	$1,904,263	+214

§ *Four-week average.*

COST OF LIVING INDEX . . . . EMPLOYMENT

	August 1945	August 1946	% Change	July 1946	% Change July to August
Consumers Price Index, B L S	129.3	143.7	+11.1	141.0	+1.9
Rent (Housing) Index, B L S	108.3	108.7	+0.4	108.5	+0.2

	September 1945	September 1946	% Change	August 1946	% Change August to September
Const. Employment (est.), thous., B L S	1,097	2,296	+109.3	2,316	−0.9
Private Const. Employ. (est.), thous., B L S	843	1,871	+121.9	1,892	−1.1


CONSTRUCTION WAGES

ENR 20-Cities Average Hourly Rates

Entrained Air Makes Airport Concrete more durable

PAVEMENT made with Atlas Duraplastic air-entraining cement. Chicago Municipal Airport (formerly Douglas Airport), Park Ridge, Ill. Designed and supervised by U. S. Engineers and The Austin Company; Contractors, Standard Paving Company, White Consolidated, Inc., and Thomas McQueen Company.

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ENR-D 41

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News of the Week

ENGINEERING NEWS-RECORD • OCTOBER 3, 1946 • VOLUME 137 • NUMBER 14

Housing program for 1947 needs new public works

American Public Works Association warned that service facilities must be extended to new areas — Urge clear municipal labor policies to prevent strikes

Municipalities must be prepared to extend their public works service facilities immediately, or face the penalty of failure of home construction programs in 1947, Frank W. Herring, director of the Land and Public Services Branch, National Housing Agency, warned last week.

"Thus far," Mr. Herring told members of the American Public Works Association at Fort Worth, Tex., "the bulk of house-building has been done on sites already provided with such essential services as streets, water and sewer lines and other utilities.

"We have been filling up the 'nooks and crannies' of our cities," he warned "but to meet fully the demands for housing, many new areas must be developed. Estimates indicate that new land brought into use will aggregate over 300 square miles. The investment, exclusive of construction cost, will be in the neighborhood of a billion dollars.

"Action by local governments is necessary for achievement of next year's housing goals. The federal government cannot tell a city where its new housing should go, or what the city plan should be. It cannot plan or build the sewers, waterworks or school buildings that will be needed.

"These problems must be foreseen and necessary local action must be taken before public works bottlenecks develop. At the earliest possible moment, cities should formulate programs setting forth the steps that must be taken to provide desirable locations and make them usable for housing."

Labor problems

The three-day meeting, which saw the seating of Samuel S. Baxter, projects engineer of the Bureau of Surveys and Zoning, Philadelphia, Pa., as president, saw also the airing of many problems facing the municipal official.

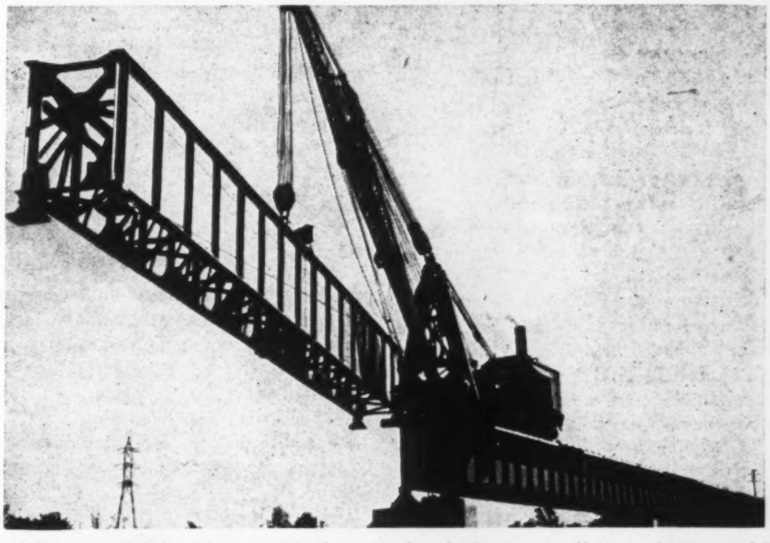
Paramount among these is the problem of labor relations with municipal employees, where present unrest reflects the general lack of a proper policy for handling grievances and other personnel relations, according to R. E. McClure, city manager of Wichita, Kan..

"It is essential that cities announce openly where they stand on labor relations before, rather than after, a crisis has developed. Such a declared policy," Mr. McClure added, "should provide, among other things, for the establishment of channels of access or communication between employees and management. Most importantly, management should insist on written agreements containing a 'no strike' clause."

In Baltimore, reported N. L. Smith, chief engineer of the Department of Public Works, an agreement has been in effect with an AFL union since July, 1941, that specifically prohibits the discontinuance of service by strikes. Any disputes that arise are first discussed by shop committeemen with the heads of their divisions and if no agreement is reached the chief engineer is empowered to make final disposition of the case. No cessation of work has ever occurred, said Mr. Smith.

In a session devoted to a discussion of equipment needs of municipalities, several members pointed out gross inadequacies of equipment used in

(Continued on page 56)



***Aluminum Bridge Span**—Made entirely of aluminum alloy, including cold driven rivets, a 100-ft. span deck plate girder weighing only 53,000 lb. will carry Cooper E-60 railroad loading over the Grasse River on the Massena Terminal R. R. at Massena, St. Lawrence County, N. Y. Due to the light weight, the span could be shop fabricated complete and set as a unit. Almost identical steel spans in the same bridge weighed 128,000 lb. Each of the two girders of a steel span had to be set separately with cross bracing installed and riveting done after erection. The 120 x ¾ in. web plate and other components, including 8 x 6 x ⅝ angles, all of 14S-T alloy, were supplied by the Aluminum Company of America. Bethlehem Steel Co. did fabrication and erection.*

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Construction—The Daniel Construction Co. of Greenville, S. C., has been awarded a $9,000,000 contract for a kraft and paper mill for the Robert Gair Co. at *Savannah, Ga*. . . . A $12,000,000 construction contract has been awarded to the Foster-Creighton Co., Nashville, Tenn., for a copper fabricating plant for the Wolverine Tube Division of the Calumet and Hecla Consolidated Copper Co. at *Decatur, Ala*. . . . Chrysler Corp. has plans under way for a parts assembly plant at *Newark, Del.*, to cost nearly $2,000,000. . . . Hillcrest Hospital at *Tulsa, Okla.*, has plans for a $2,000,000 expansion next spring. . . . Construction has been started at *Norwich, N. Y.*, on the first two units in a long-term building program for the Norwich Pharmacal Co. which ultimately will give it 650,000 sq. ft. of space in one plant. The Austin Co. is handling the design and construction of the welded steel frame buildings. . . . Contractors, builders and material dealers in *Charleston, S. C.*, said they may be forced to take a six-months vacation unless priority regulations are changed so as to allow them to use present supplies for other than homes for veterans.

Highways—An application for a number of new road projects to improve traffic conditions at *Bluefield, W. Va.*, will be submitted to the State Road Commission. . . . The Third Street Bridge over the Christina River at *Wilmington, Del.*, closed since last July 15, was re-opened Sept. 20. . . . *Illinois* will have $242,353,000 from its own or federal funds to finance highway construction during the next three years. . . . The *Connecticut* departments of highways, motor vehicles, police, traffic, education and highway safety will make reports to the State Highway Safety Commission as to their parts in traffic safety measures. . . . The Duval County Board of Commissioners has agreed to acquire the right-of-way for a 12-mile superhighway from *Jacksonville* to *Bayard, Fla*. . . . The *Oklahoma* State Highway Commission expects to announce soon a $2,500,000 road program. . . . The last 11 miles of hard surface on U. S. 23 in *Kentucky* was opened Sept. 14. It cost an average of $76,000 a mile. . . . A 27-mile highway linking *Kingman, Ariz.*, with Davis Dam is about 25 percent completed.

Good progress on survey of engineers reported to Engineers Joint Council

Questionnaires sent to 90,000 engineers are coming back rapidly—A survey of practices of employers of engineers planned

Unusually good returns from the questionnaire sent recently to the members of the six major engineering societies (*ENR* Sept. 12, vol. p. 333) was reported at the quarterly meeting of the Engineers Joint Council held in New York on Sept. 26, by I. Melville Stein, who is chairman of the council's Committee on the Economic Status of the Engineer.

The survey is being conducted as a joint undertaking of the council and the Bureau of Labor Statistics of the Department of Labor. Mr. Stein said that Wm. N. Carey, chairman of the subcommittee in charge of the survey, had reported to a meeting of his committee held on Sept. 25 that enough returns already had been received to insure the "statistical stability" of the results received.

This survey relates to earnings of various classes of engineers during the war years. In addition to the questionnaire going to members of the major engineering societies, the National Roster of Scientific and Specialized Personnel also is sending the same questionnaire to a selected group of names on its list, which accounts for the key numbers on return envelopes, which Mr. Carey said, have raised questions in the minds of some engineers as to whether the survey actually was anonymous. The survey is completely anonymous, Mr. Carey said.

Employer survey planned

Mr. Stein reported that within a short time his committee will send to 2,000 employers of engineers a questionnaire relating to their employment practices. A sampling of 200 employers already has been made to determine whether satisfactory results could be obtained with the questionnaire prepared by the committee.

The Committee on the Economic Status of the Engineer is now completing work on the preliminary draft of Part I of its proposed manual on collective bargaining for professional engineers. It hopes to be ready to publish the manual in a few months.

Many books collected

Offers of technical literature for foreign libraries have reached an imposing total, according to Malcolm Pirnie, chairman of the EJC Committee on International Relations. To date, the Book Commission has received offers of 4,100 engineering books, 12,000 technical periodicals and 6,000 copies of transactions and proceedings of engineering societies. Engineers having books to contribute were asked to advise Stewart E. Reimel, secretary of the committee, at 33 West 39th St., New York.

Mr. Pirnie also reported that his committee had designated Everett S. Lee, F. W. Farquharson, and C. E. Davies to represent it at the discussions to be conducted by a proposed world organization of engineers held in Paris in September. (A report of action taken at the meeting in Paris is given on page 58 of this issue).

Financing EJC operations

Expenditure of $24,000 on the survey of the engineering profession and the other activities of the economic status committee has been approved by the participating societies. Other activities of EJC are expected to require an additional $5,400.

J. E. Jagger, assistant secretary of the American Society of Civil Engineers, who is now acting as secretary of the Engineers Joint Council, has been named secretary-treasurer of that organization and a separate financial structure has been set up for it. Heretofore, financial matters of the five-society organization have been handled by the treasurers of the sponsoring societies.

NATIONAL EDITORIAL AWARD WON BY NEWS-RECORD

For the third time in four years, *Engineering News-Record* last week was among those publications adjudged in an annual competition to have shown outstanding editorial achievement.

The publication received an award of merit "for the best single issue published during the twelve months ended July 31, 1946," the award being based on the Dec. 13, 1945, issue which was entirely devoted to construction phases of the production of atomic bombs.

More than 400 publications submitted exhibits for the annual competition, which is conducted by the magazine *Industrial Marketing*.

In 1943, *Engineering News-Record* carried off first honors in the competition, and in 1945 received another award of merit for its handling of reports from the European War Zone.

AED head scores surplus disposal as hampered by red tape, politics

Associated Equipment Distributors meeting at Washington urge speed, simplification of methods to release construction machinery

The disposal of millions of dollars' worth of construction machinery by the War Assets Administration is being blocked by "red tape and political considerations," Frank B. McBath, of Portland, Oregon, president of the Associated Equipment Distributors, told a group of organization officials at Washington last week.

Mr. McBath's statements at the Washington meeting of leaders of the association were a part of AED's continuing drive for speeding up and simplifying the disposal of construction machinery declared surplus by the Armed forces and now being held by WAA.

Frank B. McBath
sees politics in WAA operations

The drive began to take form at the organization's annual convention last February (*ENR* Feb. 7, vol. p. 167) and was formalized in a resolution last June in which the board of directors charged that the Surplus Property Act was not being administered as intended by Congress.

The urgency of the disposal problem as it affects distributors of construction machinery resulted last week in the appointment of Frank Knight, AED assistant secretary, as secretary of the organization's Committee on Disposal of Government Surplus. Mr. Knight has been instructed to work directly with WAA officials handling construction machinery, and to assist AED members in obtaining any available surplus in their areas. Concurrently with Mr. Knight's assignment to this task, F. Gerald Moyer, until recently assistant director of WAA sales group 1, has been appointed field representative to the AED committee to function in a public relations capacity in all matters affecting surplus property.

NHA action criticized

Addressing members of the committee on disposal at Washington, Mr. McBath charged that disposal of surplus machinery "has been and is being blocked by a governmental bureaucracy that fails to see the forest of national economy for the trees of red tape and political considerations."

"To illustrate what I mean by political considerations," Mr. McBath said, "I cite the new National Housing Administration priority regulation freezing, in the name of the veterans housing program, all surplus batching plants, cranes and shovels up to 2½ cu. yd., machines, motor graders, and similar equipment.

"Nobody disputes the fact that no stone should be left unturned to provide comfortable and economic housing for veterans. However, there seems to be some justifications for the argument of many well-informed authorities that the term Veterans Housing is being used as a smokescreen for purposes that have nothing to do with providing housing for service men.

"The distributors of construction machinery are seriously affected by this situation. Much of the machinery now frozen by NHA edict is actually needed more for heavy construction than for the residential type of construction. If NHA persists in its apparent determination to channel all construction materials and machinery into housing for veterans, with no consideration to other construction needs of the industry, then the conclusion cannot be escaped that the needs of an adequate housing program for veterans has been distorted and magnified into proportions entirely out of balance with a well organized national economy.

"Because of red tape to end all red tape, misinterpretation of intent of Congress and other bureaucratic processes, the flow of surplus into productive channels has been a thin trickle that produced no gain or advantages for the industry or for the taxpayer," the AED president said.

Mr. McBath's talk ended with praise for R. M. Littlejohn, recently appointed WAA administrator, but with the statement that he views Mr. Littlejohn's currently reported efforts to reorganize WAA "with fingers crossed."

Ask bids on $1.5 million Dallas purification plant

The city council of Dallas, Tex., recently approved a call for bids for a new clarifier basin and a chemical mixing basin for the city's Bachman water purification plant. Engineers estimated the project will cost $300,000 to $400,000, to bring total cost of the plant to about $1,500,000.

Previously, the council had asked for bids on the construction of a 5,000,000-gal. clear water basin and eight new water filters. The contracts call for completion by May, 1947.

Next year, after the peak summer water season has passed, contracts will be let for a chemicals building and the modernization of two clarifier basins at an estimated cost of $400,000, according to Karl F. Hoefle, water superintendent. This will complete the expansion program for the Bachman water plant.

Twice, previously, bids on the work have been rejected because the council considered them too high. However, the inability of the water plant to meet the demands for water during the peak season forced continuance of the water plant expansion program regardless of high costs.

Saginaw-Midland awards $10 million water contract

Construction of the Saginaw-Midland water supply project to deliver water from a submerged crib and intake in Lake Huron through 81 miles of pipeline to the two Michigan cities got under way officially last week when the two city councils approved contract awards totaling $10,244,000, leaving only a few thousand dollars still to be awarded. Contracts are divided into about 15 parts, awarded separately, ranging in value from $12,000 to more than $5,000,000.

Included in the project are a submerged crib in 50 ft. of water, 10,000 ft. of 66-in. steel intake pipe, 81 miles of prestressed reinforced concrete mains comprising 48 mi. of 48-in., 30 mi. of 36-in. and 3 miles of 24-in., and two pumping stations of 70-mgd. each.

Principal contractors are listed on page 163 of this issue.

Sponsored jointly by the two cities of Saginaw and Midland, the project extends from Whitestone Point on Lake Huron across three counties. The engineers in charge of design and construction of the project for the Saginaw-Midland Water Committee are Alvord, Burdick & Howson, Chicago.

Public works meeting

(Continued from page 53)

municipal work. For instance, there is an urgent need for an efficient leaf-collecting machine to replace the many improvised, units now employed.

For snow removal there is needed something in the way of a power-broom mounted behind the conventional one-way or V-type plow, to remove the last one or two inches of snow left by the plow, which necessarily must be set high enough to pass over manhole covers. Ordinarily this snow turns to ice, requiring the addition of calcium or sodium chloride, or mechanical methods of removal.

Refuse-collecting trucks should be easier to load and they should be built to greater capacities, with narrower bodies for alley use. Truck chassis should be equipped with wider cabs both for greater driver safety and to accommodate a four-man work crew. Also, they should have a shorter turning radius.

Another piece of equipment that should be developed for municipal use is an improved loading device for the conventional dump truck for excavated earth, sand, cinders, etc.

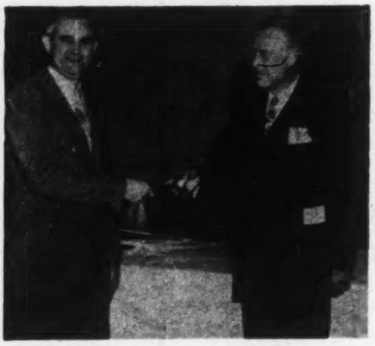
In general, the consensus of the municipal operators was that greater demands should be made on the manufacturer to develop equipment designed specifically for municipal operation, rather than a continuation of adapting standard equipment for the requirements of each city.

To this end, it was suggested that an Equipment Specifications Committee be set up within the APWA to study the needs of municipalities and prepare basic specifications.

Technical reports

Airports, express highways, planning traffic safety and observations on German water supply and sewerage practice were among topics discussed at the technical sessions of the annual meeting.

Bombing of water supply dams in Germany had a tremendous effect on public morale, and resulted in special precautions, according to M. W. Tatlock, consulting engineer of Dayton, Ohio, who served abroad with the Army Military Government organization. Following the Mohne and Eder bombings, Mr. Tatlock said, orders were issued by the German military that pressure behind all dams was to be reduced by lowering water levels. Actual protective construction behind the dams consisted of erecting pylons 328 ft. high on each side of the lake, 550 yd. from the dam, between which a heavy steel cable was suspended to block low-flying attach bombers.



Changing Hands—*Samuel S. Baxter (left) new APWA president, receives gavel of office from Lloyd M. Johnson, retiring president of the group at Fort Worth, Tex., meeting*

Research was undertaken with "water wall". Methods of protection, involving use of submerged mines across the lake which could be blown by remote control to create a wall of water 460 ft. high to force attackers to fly too high to damage the dam. No new processes of sewage treatment or development were found in Germany, he said.

New officers

Samuel S. Baxter succeeded Lloyd M. Johnson, commissioner, Department of Streets and Electricity, Chicago, as president.

Vice presidents chosen for the coming year are: Edward J. Cleary, executive editor, *Engineering News Record*, (Eastern area); M. W. Tatlock, consulting engineer, Dayton, Ohio (Central area); and J. W. Morgan, commissioner of public improvements, Birmingham, Ala. (Southern area).

Resolutions adopted

Among the resolutions adopted at the closing session of the congress was one urging that steps be taken by the proper federal authorities to stimulate increased production of such critically scarce materials urgently needed by municipalities to serve both emergency and permanent housing, such as soil pipe, water mains, sewer pipe, etc.

All members of the association were urged to promote the holding of safety conferences in their respective communities to discuss highway safety and to formulate local action programs embracing: (1) uniform traffic laws and ordinances, (2) safety education and traffic law enforcement, (3) traffic engineering, and (4) public support all in accordance with recommendations of the President's Highway Safety Conference.

The location and date of next year's meeting were not decided.

Philadelphia plans a $20 million road

Engineers prepare plans to raze "Chinese Wall" and build new thoroughfare — Chattanooga considers widening Rossville Boulevard

On the recommendation of the City Planning Commission, the City of Philadelphia, Pa., last week announced the selection of a New York engineering firm to plan a new $20,000.000 mid-city boulevard, and the attendant project of razing the city's "Chinese Wall" —the Pennsylvania Railroad's approach to the downtown Broad Street station (*ENR* Sept. 26, vol. p. 404).

The project is a part of a general plan to modernize the city's internal communications and relieve traffic congestion.

Selected for the planning work is the firm of Gilmore D. Clarke, Michael Rapuano and Leslie G. Halleran.

The Philadelphia architectural firm of Harbeson, Hough, Livingston and Larson, successors to Paul Crest, will be employed as consultants on the design of bridges and other structures.

The present "Chinese Wall" will be superseded by a four-lane boulevard from Broad St. Station to the 30th St. Station of the Pennsylvania Railroad in West Philadelphia. Meanwhile it Larson, successors to Paul Cret, will share the cost jointly with the city and state. Thomas Buckley, Chief of the Philadelphia Bureau of Engineering and Zoning, has estimated the total cost of $20,000,000.

The location of the East River Drive and the two-level West River Drive between Market and Arch streets and the movement of traffic around the 30th St. Station, including a plaza west of the station are to be incorporated in the plans.

Chattanooga's boulevard plans

An appraisal estimate of $268,964 as the cost of acquiring property for the proposed widening of Rossville Boulevard in Chattanooga, Tenn., was announced Sept. 17 by Commissioner of Streets and Sewers P. R. Olgiati.

Commissioner Olgiati said official notification of the appraisal estimate had not reached him yet from the state highway department, but that when he received it he will recommend that the city commission undertake the highway project.

Under the proposal the state and federal governments would construct the highway at a cost of approximately $1,000,000, and the only cost to the city would be one third of the right-of-way cost. the commissioner said.

Transport congress hears criticism of federal road financing methods

Speaker at Washington meeting sees failure of roads program unless financing is corrected—other problems discussed

A severe criticism of the federal government for its financing methods on highway construction, and the prediction that this financing method would be a failure unless corrected was voiced by a major speaker in meetings on highway use at Washington last week.

Addressing a two-day transportation congress, held under the auspices of the National Highway Users Conference, Charles L. Dearing of the Brookings Institution said that dissipation by the federal government of highway-user funds on road construction and promotion, with no attempt at recouping maintenance or capital costs threatened the current highway program with financial failure.

"The national government has followed a policy . . . of spending vast amount of the general tax funds for transport promotion, with little or no attempt to recover directly from highway users any portion of the maintenance or capital costs," Mr. Dearing told his listeners.

State financing praised

In comparison, the work of the states to date is worthy of praise, Mr. Dearing declared, in that many states have sought to manage the highways as self-supporting business enterprises, adopting the policy that those who benefit most directly from highway use should foot the bill.

"In view of these striking contrasts between state and national stewardship," the speaker continued," there is a certain irony in the recent preoccupation of the national government with whether or not the several states are exacting the precisely correct amount of direct payments from highway users.

"This futile quest for arithmetic certainly ignores the substance of the problem. Our system of highway finance is basically sound if it meets one elementary test—does it produce a reasonably fair distribution of total highway costs among those who demand and benefit most directly from road and street use. There is, of course, a corallary and equally important test—do the charges for road and street service reflect efficient and progressive management."

Commenting on present methods of financing work on the secondary highway system, Mr. Dearing said that since 1930 there has been "a marked tendency" to violate standards of equity in the expenditure of user funds.

"Responsibility of motor vehicle owners for the highway expenses has been extended to the support of vast mileages of local roads whose existence and use are a matter of indifference to most motorists" he concluded.

Changes in size restrictions

At the closing session, three resolutions recommended by the Weight and Size Committee were passed by the congress as a whole, the resolutions being directed to the Board of Governors of the National Highway Users Conference. One resolution recommends that the state legislatures be urged to pass laws permitting the operation of intercity buses 102 in. wide on routes where the highway surface is 20 ft. or more wide, their operation on highways of less width to be allowed only with the expressed permission of the state highway authorities.

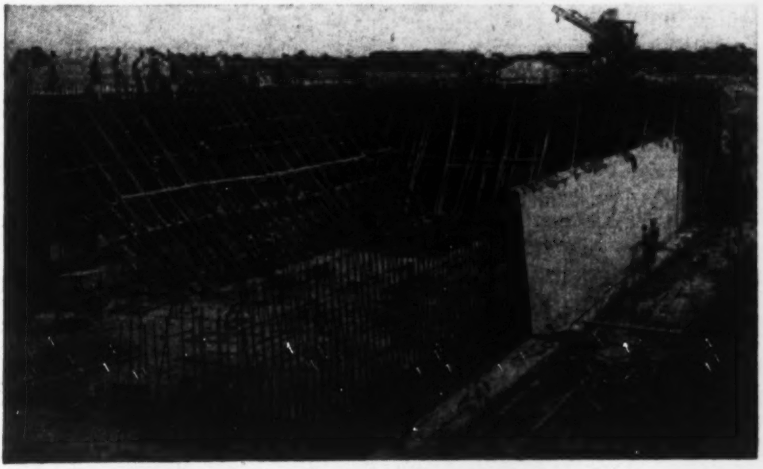
The second resolution recommends that the American Association of State Highway Officials be urged to consider increasing height limitations for trucks and other commercial vehicles from 12½ ft. to 13½ ft. Although it was pointed out that there are numerous highways where clearances make this impossible, it was felt that the greater height should be permitted where such clearances are available.

A resolution recommending that the ASSHO recommendations concerning dimensions, weights and speeds of motor vehicles be looked upon as minimums only, and not as maximum as in some states, was also passed.

In committee discussion of the resolution regarding the 102-in. width, data made available by the Greyhound Corp. revealed that in the 973 mile route from Chicago to New York via Toledo, Buffalo, and Newark, only 80 miles had pavement widths less than 20 ft. The average width for this route is 31.6 ft.

Parking problem

The lack of adequate parking facilities in the downtown sections of so many American cities and the severe congestion of traffic at peak hours in those areas also received extensive attention at the convention. Three possible methods of relieving traffic congestion in the downtown sections outlined by Harold S. Buttenheim, editor of *The American City* Magazine, found considerable favor. These methods are: (1) construction of bypass routes for through traffic, (2) construction of storage garages or other off-the-street parking and loading facilities on private property by the business interests affected, at their own expense with a low rate of charge to their customers, and (3) widening or double-decking of existing downtown streets.



***New Power Plant**—Concrete pouring is well under way as the South Carolina Power Co. starts construction of a $2,795,000 steam electric generating station at Charleston. The base slab will be four feet thick. The tapering temporary wall in right foreground will be removed when a second unit is installed at a later date, since the plant is designed for an eventual four units. Standard Construction Co. of Columbus, Ga., is contractor, with power company engineers supervising the work.*

Demands beyond production capacity blamed for construction difficulties

Other speakers at silver anniversary of Producers' Council stress obstacles provided by high costs, legal restrictions and government regulation; discuss prospects for industry future

Demand for construction beyond the nation's capacity to produce materials and equipment is the cause of the present difficulties of the construction industry, John D. Small, administrator of the Civilian Production Administration told members of the Producers' Council at its annual convention in New York City last week.

Mr. Small was the first speaker at a convention that marked the 25th anniversary of the founding of the council, which was formed at the instigation of the American Institute of Architects as a trade organization of building materials and equipment manufacturers. His address and those of others served to provide members with a review of efforts to improve marketing and other services to the building industry, and with a picture of the economic outlook of the construction industry in general —with particular emphasis on the housing field.

Reviewing the difficulties that beset construction men, Mr. Small pointed out that the United States labor force is now near its ultimate size and cannot be expected to rise appreciably. He said that production of most building materials has increased beyond CPA expectations, and the fact that there are 58 items still in short supply and on priority lists is "merely a reflection of a demand beyond the hope of immediate satisfaction."

Under these circumstances, Mr. Small would make no predictions as to prospects for easing of the situation, saying only that he could see no letup in the demand in the forseeable future.

As to short items, he listed light gage sheet steel, hardwood flooring, cast iron soil pipe and nails. Some 34 billion feet of lumber will be available this year as compared to 28 billion last year. Prospects for 1947 are for 38 billion, include two billion of imports. The problem with lumber is that inventories are at an all-time low, so that distribution channels are chaotic". By winter, Mr. Small said, brick will no longer be on the shortage list.

Market prospects

Turning from the problem of supply to that of prospective markets, Vergil D. Reed, associate economist of the J. Walter Thompson Co., advertising agency, warned that customers are being priced out of the housing market, with consequent bad public relations for the industry. He recommended the formation of some industry organization to remove such obstacles to high costs as obsolete building codes, restrictive manufacturing processes, improper land utilization, labor hoarding and cooperation with labor in restrictive practices. Mr. Reed warned against planning on a market of 12,600,000 homes during the next ten years, as the National Housing Agency has estimated, unless prices come down. He cited figures to indicate that much doubling-up in existing housing is possible unless prices do come down. James R. Edwards, president, American Institute of Architects also stressed the necessity for cost reduction, while John E. Wiley of Fuller & Smith & Ross urged intensified and improved public relations for the industry through local representatives such as dealers, distributors and contractors.

One way to ease costs would be to improve the balance in the emergency housing program between apartments and individual houses, said Thomas S. Holden, president F. W. Dodge Corp. More apartments are needed because they use smaller quantities of critical materials, and because basic construction costs of such housing units are only 40 percent above 1939, while single-family house costs are up 60 to 65 percent.

Wilson Wright, economist of the Armstrong Cork Co. and chairman of the Council's Market Analysis Committee, reported the estimated value of new 1946 construction to be $9.2 billion, including $3 billion of permanent type non-farm housing. For 1947, an estimate of $11.7 billion has been made, and for 1948 and 1949, $14.6 billion.

Plans for the future

Out of a panel discussion relating to markets and trends came numerous warnings and suggestions. Admiral Ben Moreell, new president of Turner Construction Co., emphasized that the future of construction is tied up with broad political and economic questions such as the peace treaties, our policy

(Continued on following page)

Set up interim world engineer group

An interim organization which will serve as a basis for a strong world engineering federation was the chief result last week of a meeting at Paris, France, of 1,200 engineers representing all branches of the profession and some 30 countries, including the United States.

Meeting as an international technical congress (*ENR* Aug. 29, vol. p. 269), the group held week-long sessions to exchange information, visit industrial plants and listen to talks in several languages on the present and future tasks confronting engineers in rebuilding world economy and making it secure.

The new interim organization, to be known as the World Engineering Conference, is to be composed of representatives from engineering societies of all nations. It will be directed by an executive board composed of representatives of twelve countries, including The United States, France, Great Britain, Poland, Switzerland, Czechoslovakia, China, India and Egypt. Three seats were left vacant temporarily to allow inclusion of other countries, such as Russia, which were not represented at the meeting.

Under the leadership of Aristide Antoine, former president of the Union of French Engineers, the new conference will sound out national engineering associations on the sort of permanent world engineering federation they desire, and then attempt to work out the details of such an organization.

Temporary American representative on the executive board is Fenton B. Turck, a member of the Joint Committee on International Relations of the Engineers Joint Council.

The congress meeting at Paris in its five-day session, heard summary discussions of 130 reports and ended by approving a great number of resolutions, many of them emphasizing the social responsibility of engineers to work for human progress in their own fields, and to organize internationally for diffusion of their knowledge.

Specifically, the congress recommended that the United Nations organize an engineering staff in its secretariat, call on engineers to help in reconstruction problems, and called for the creation of one or more international engineering schools.

on outlying bases, and the confidence of the investing public. There is a big backlog of planned construction, he said, but it should not lead the construction industry into a feeling of false security as to its future. More of the opportunities will turn into jobs if construction salesmanship is used than if it is not.

John J. Brennan, secretary and treasurer of the Building Trades and Construction Council, reported that the building trades have agreed to increase working hours from 6 to 7 per day to increase output, and that nearly 8,000 apprentices are now registered in schools in New York State. At present, the problem is to provide enough jobs for the apprentices to work on.

Both Max H. Foley, architect and William J. Levitt, large-scale home builder, spoke in favor of immediate lifting of controls on building. Mr. Levitt was emphatic in declaring that removal of OPA would bring construction costs down from the black market levels on which they now rest.

Howard Whipple Green, director Cleveland Real Property Inventory, urged a change in thinking respecting the level of housing costs and rents. All houses and rents were downgraded in the 1930-40 decade, and we are now merely reversing this process. House costs and rents should have a relation to incomes and savings, which now are at a high peak. Yet, pointed out Mr. Whipple, rents are only 8 percent above 1940 and are still 32 percent below 1930 levels.

Citations awarded

All of the sessions were presided over by L. C. Hart, of the Johns-Manville Sales Corp., president of The Producers' Council for the past two years, during which the membership has increased to 105 companies and trade associations, an all-time high. The newly elected president is Tyler S. Rogers, assistant to the executive vice president of the Owens-Corning Fiberglas Corp.

A feature of the program was the award of citations to pioneers in dimensional coordination—or modular construction—whose constructive efforts are beginning to show substantial dividends. Fourteen individuals were so honored: M. W. Adams, executive secretary and Prentice Bradley, architect of the Modular Service Association; Theodore Irving Coe, technical secretary of the American Institute of Architects; E. W. Dienhart, executive secretary of the National Concrete Masonry Association; Max H. Foley, architect; James W. Follin, managing director of the Producers' Council; Frederick G. Frost, Sr., architect; Frederick Heath, Jr., consultant, National Housing Agency; A. Gordon Lorimer, chief architect, Department of Public Works of New York City; Harry Plummer, director of engineering and research, Structural Clay Products Institute; W. C. Randall, chief engineer, Detroit Steel Products Co.; W. M. Steinbauer, former secretary-manager of the National Door Manufacturers' Association; and Henry Wright, managing editor of the *Architectural Forum.* In addition, a posthumous citation was presented to the family of Albert Farwell Bemis, former industrialist and pioneer exponent of standardization.

Nine-month steel scarcity forecast

Barring prolonged strikes, the steel industry is confident that steel supply and demand will be in balance by mid-1947, but if steel users come "anywhere near to trying to carry out their present production programs, there will not be nearly enough steel to go around for the next nine months", according to a "Report to Executives" published in the Sept. 28 issue of *Business Week*, a McGraw-Hill publication.

Estimates of the demand for steel, *Business Week* said, for the year ending June 30, 1947, come to 67 million tons as the following table shows (figures in millions of product tons):

Autos and trucks	11.5
Construction	9.0
Railroads	7.0
Other producers' durables	12.0
Containers	5.0
Petroleum and gas	3.5
All other industries	6.0
Exports	8.0
Increase in inventories	5.0
Total	67.0

The maximum probable ingot production for the year ending June 1947 is 83 million tons which can be converted into 60 million tons of finished steel products, some 11 percent below definite demand. (About 30 percent of the weight of ingots is turned into scrap in the process of rolling sheets, rails, plates, structural shapes and other finished steel products.) These figures compare with a total of 49.3 millions of product tons for the year 1940. Four great industries—autos, construction, machinery and railroads—took three-fifths of the steel in 1940 and account for the same share of total demand in the year ending next June 30.

Concerning construction, the report stated that in prewar years a ton of finished steel was shipped to the construction industry for every $1,050 of new construction. In the next year, however, less steel will be needed per dollar of new construction both because housing will make up a larger proportion of the total building and because other building costs have gone up more than have steel prices. For these reasons, the $12 billion of new construction scheduled under the Wyatt program will take about 9 million tons of finished steel, more than a million tons less than went into the $10 billion of new construction in 1941.

Construction will get steel

The most definite thing that can be said about the impact of the shortage on steel consumers is that it will not be handled by requiring each steel buyer to take 11 percent less steel than he would like to buy. The government will use its priority powers to make certain that steel requirements for veterans housing, food production and packaging and essential rehabilitation of devastated areas are met in full and that small businesses gets a share through warehouses. But priorities will cover less than 10 percent of the total steel output and the remainder is to be parcelled out by steel companies on an equitable basis with emphasis on the share taken before the war. Partly because of the fact that construction will not be seeking a larger share of the total than in the year 1940, construction demands will be met in full.

As to prices the one sure thing is that they are going up. Demand will outrun supply for some time to come and profit margins have been squeezed as costs have risen faster than prices. It seems certain that average steel prices would go up in a free market by something like $2 to $3 per ton. They probably would not rise more than that because steel makers have a genuine interest in holding down prices to discourage competition from substitute materials.

Commenting editorially *Business Week* said:

"There is every reason to believe that, if left free from ministrations of the Office of Price Administration, the forces of the market would apportion steel among the various bidders for it much more expeditiously as well as much more effectively. . . . There is far less reason to believe, however, that any prompt release of steel from price control is now in prospect."

Single copies of Business Week's Report to Executives on Hard-to-Get Steel are available gratis on request to Paul Montgomery, Publisher, Business Week, 330 West 42nd St., New York 18, N. Y.

Colonel Heavey to head North Atlantic Division

On Oct. 1, Col. William F. Heavey, district engineer of the New York Engineer District, became acting division engineer of the North Atlantic Division, with headquarters in New York City.

Colonel Heavey succeeds Col. Charles L. Hall, who had been district engineer since Dec. 1, 1945. Colonel Hall has been detached from this post for assignment as resident member of the Army's Beach Erosion Board, in the Office of Chief of Engineers.

As acting division engineer, Colonel Heavey will head a division which recently absorbed the Middle Atlantic Division (*ENR* Sept. 26, vol. p. 406).

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California contractors penalized by WSB

Penalties amounting to $34,265 have been imposed on seven northern California contractors by the tenth regional Wage Stabilization Board for paying excessive wage rates—up to $5 or $6 a day over approved standards—to plasterers, lathers and painters.

The penalties were assessed in the course of an intensive enforcement investigation by the board to push down the black market wages in the construction industry that it is claimed are channeling workers into commercial building.

The amount of the penalties will be disallowed by the Internal Revenue Bureau in computing the employer's costs for income tax purposes.

Many contractors in the area failed to roll back wages to June 30 approved levels following the June 30-Aug. 10 "wage holiday," the board charged. It reported that numerous complaints from the field indicate overpayments to plasterers of up to $8 for a six-hour working day. It added that plasterer tenders get $13 for a six-hour day against an approved $1.75 an hour rate and lathers receive $2.25 an hour instead of an approved $2.

Richard A. Perkins, attorney for the regional board, laid partial responsibility for the condition on union leaders. "Many contractors have indicated their willingness to abide by established wage rates," he said, "but reports indicate that the local unions involved insist on receiving excessive rates and diverting labor from jobs paying legal rates to jobs paying black market wage rates. In many cases the contractors claim may be exaggerated, but we have every reason to believe that in some cases it is true."

Bridge Canyon tunnel declared feasible

A 77-mile tunnel to bring Colorado River water to Arizona irrigators and municipalities is a physical possibility, a board of engineers advised the Bureau of Reclamation at Phoenix, Ariz., last week.

The tunnel would be a vital part of the proposed $325,000,000 Bridge Canyon Project (*ENR* May 24, 1945, vol. p. 742).

The board of engineers making the report was headed by Charles P. Berkey, professor of geology at Columbia University, New York City, and included J. S. MacDonald, New York consulting engineer and Joseph L. Burkholder, San Diego, Calif., consultant. The group recently completed a series of field surveys, and submitted a report which said that driving the proposed tunnel through the rock formations it would encounter was considered physically possible.

The Bridge Canyon project—one of three which have been under consideration for the past two years as a means of supplying Arizona with the 2,800,000 ac. ft. of water to which it is entitled under Colorado River water agreements—would include construction of a dam near the head of Lake Mead an 82-mile canal, the tunnel, a regulating reservoir.

The engineers' report on the tunnel will be incorporated in an overall report on the project.

Announce tentative plan for Delaware bridge

Drawings for the projected Delaware River Bridge (*ENR* Oct. 11, 1945, vol. p. 471) will be submitted to a joint Army-Navy board of approval at a hearing to be held either in Wilmington, Del., or Philadelphia, Pa., after Nov. 1, according to the office of the Chief of Engineers.

On the board for the Army will be Brig. Gen. R. C. Crawford, Col. C. L. Hall, and Col. Wayne S. Moore. The Navy member of the board has not yet been named. Lt. Gen. Eugene Reybold, U. S. A., retired, director of the Delaware River Crossing Division of the Delaware State Highway Department, will represent the state.

Preliminary plans call for a suspension bridge over the 800-ft. wide river channel below the Wilmington marine terminal with a clearance of 175 ft. over mean high water. Preparing the preliminary plans are Howard, Needles, Tammen and Bergendorff, New York and Kansas City, Mo.

Preliminary exploration of the pier sites in the Delaware River have not found rock at a depth of 400 feet.

The law authorizes the State Highway Department to construct, maintain, operate and collect toll on the bridge. It is required that a sinking fund be maintained from the tolls collected to amortize the cost of construction within 30 years. The estimated cost is $25,000,000.

***Airport Out of a Mountain**—The hilly terrain around Cumberland, Md., makes mountain-moving a necessity in construction of a Civil Aeronautics Administration-sponsored municipal airport. To provide for three 175 ft. wide runways (with 150 ft. paved centerstrip) varying in length from 3,500 ft. to 5,800 ft., more than 900,000 cu. yd. of excavation—much of it rock—is required. Grading contract is held by Grandview Construction Co., Mt. Vernon, N. Y. Paving work is being done by DeMatteo and Son, Boston, Mass.*

OBITUARY

Guy Merritt Phelps, 59, head of the department of engineering drawing at Rensselaer Polytechnic Institute, died Sept. 28. He had been a member of the faculty at the institute since his graduation there in 1909, having been appointed an assistant professor in 1919. Eighteen years later he was advanced to a full professorship and head of the department, a post he held at his death.

Howard Roberts Manning, 51, engineer of rights-of-way, Connecticut State Highway Department, Hartford, Conn., died Sept. 18. He received his engineering education at Sheffield Scientific School, Yale University. Since 1926 he has served the highway department as party chief, engineer of boundary surveys and engineer of rights-of-way, the latter since May. 1945.

Charles F. Wallace, 75, former chief engineer of Stone & Webster, Boston, Mass., and later a junior partner in the firm and a vice-president after its incorporation as Stone & Webster, Inc., died at Whitefield, N. H., on Sept. 11. He was a graduate of the Massachusetts Institute of Technology, class of 1892, and retired from practice about 25 years ago. Mr. Wallace was identified with the Keokuk hydroelectric development on the Mississippi River.

John H. Congdon, 64, died Sept. 16, at Dartmouth, N. S. For about 40 years he had been active as a civil engineer in the maritime provinces, specializing in highway and bridge construction and repairing.

Peter A. Forsythe, bridge supervisor, Department of Public Works, New Brunswick, Canada, died Sept. 15, aged 82. Previous to entering into government service Mr. Forsythe was in the general contracting business.

W. Edwin Stoller, 47, civil engineer with Holabird & Root, Chicago, Ill., and formerly an engineer in New Philadelphia, Ohio, for the Ohio Highway Department, was killed Sept. 18 in an explosion which occurred while he was inspecting a caisson at the new Bell Telephone Building in Chicago.

George Douglas Bayne, 52, civil engineer in the Franklin County, Ohio, engineer's office, died Sept. 17 in Columbus.

George B. Appleton, 54, superintendent for the Gibbons-Grable Co., Canton, Ohio, construction firm, died Sept. 22. With the firm for 30 years, he supervised construction of the $1,250,000 Timken Vocational High School and other structures.

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To add $9 million unit to Buffalo power plant

As a part of a long-range program to keep pace with growing demands for power in the area, the Niagara Hudson Electric Corp. said recently that it would construct a $9,000,000 addition to the Charles R. Huntley steam-electric generating station at Buffalo, N. Y.

The new unit is scheduled to be in service by December of 1948, and will add 80,000 kw. of rated capacity to the plant, to bring the total installed capacity to 625,000 kw.

Calendar of Meetings

NATIONAL

Federation of Sewage Works Associations, 19th annual meeting, Royal York Hotel, Toronto, Canada, Oct. 7-9.

National Safety Council, annual congress and exposition, Stevens, Congress, Palmer House and Hamilton Hotels, Chicago, Ill.,

American Society of Civil Engineers, fall meeting, Continental Hotel, Kansas City, Mo., Oct. 16-19.

Associated General Contractors of America, Inc., fall meeting, Benjamin Franklin Hotel, Philadelphia, Pa., Oct. 21-22.

National Council of State Boards of Engineering Examiners, 25th annual meeting Hotel Statler, St. Louis, Mo., Oct. 27-29.

American Institute of Steel Construction, annual convention, Del Coronado Hotel, Coronado, Calif., Oct. 28-31.

American Welding Society, annual meeting in conjunction with the National Metal Congress and Exposition, Atlantic City, N. J., Nov. 17-22.

REGIONAL

American Water Works Association, Southwest Section, Buccaneer Hotel, Galveston, Texas, Oct. 14-17.

Pennsylvania Water Works Association, Golden Anniversary meeting , Hotel Traymore, Atlantic City, N. J., Oct. 15-18.

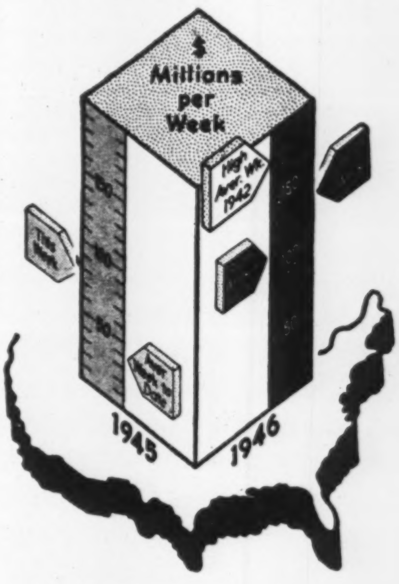
American Water Works Association, New England Section, Parker House, Boston, Mass., Oct. 17.

American Water Works Association, West Virginia Section, Hotel Morgan, Morgantown, W. Va., Oct. 17-18.

American Water Works Association, California Section, Whitcomb Hotel and Civic Auditorium, San Francisco, Calif., Oct. 23-25.

American Water Works Association, Kentucky-Tennessee Section, Andrew Johnson Hotel, Knoxville, Tenn., Oct. 28-30.

CONSTRUCTION ACTIVITY



As Reported this week to . . .
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only
(Thousands of Dollars)

	Week of October 3 1946	Cumulative 1946 (40 wks.)	Cumulative 1945 (40 wks.)
Federal	$8,514	$548,631	$680,737
State & Mun.	75,217	1,134,066	268,510
Total Public.	$83,731	$1,682,697	$949,247
Total Private	49,988	2,534,183	621,738
U. S. Total..	$133,719	$4,216,880	$1,570,985

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1946 (40 wks)	Cumulative 1945 (40 wks)
Waterworks ...	$10,758	$89.232	$40,660
Sewerage	11,060	88,372	25,369
Bridges	2,061	107.022	27,413
Highways	19,152	621.154	173,566
Earthwork, Waterways	895	313.631	40,104
Buildings, Public	37,636	331.201	416,701
Industrial ..	7,841	805.357	390,345
Commercial ..	41,216	1,561.713	155,606
Unclassified ..	3,100	299,198	301,221

NOTE: Minimum size projects included are: Waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1946 (40 wks.)	Cumulative 1945 (40 wks.)
NON-FEDERAL	$1,226,071	$622,361
Corporate Securities	357,098	145,860
State and Municipal	643,973	312,901
RFC Loans	.....	24.600
REA Loans	.....	60,000
Fed. Aid Highway	225,000	79,000
FEDERAL	1,672,982	1,049,898
Total Capital	$2,899,053	$1,672,259

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost..	Oct. '46	360.94	173.50
Building Cost......	Oct. '46	272.74	147.43
Volume	Sept. '46	223	98

EDITORIALS

VOLUME 137 NUMBER 14

October 3, 1946

Public Works and Housing

Housing construction this year is being delayed by shortages of materials. What will the story be next year when materials are expected to be more plentiful? One forcast, made before the American Public Works Association last week, was that unless action is taken now, there will be a serious lack of service facilities such as streets, water supplies, sewerage and other utilities in the newly developed sites where the bulk of housing is to be built. This forecast, by Frank W. Herring, director of the land and public services branch of the National Housing Agency, formed the basis of a plea to municipal authorities that local action be initiated to meet this contingency. We believe that his appeal deserves the sympathetic response of every public works engineer and administrator, although we also recognize the difficulties that it entails. There is hardly a city that does not have a huge backlog of requests for water service connections, which cannot be reduced because of material shortages. There are also hundreds of contracts related to new facilities or betterments, which cannot be executed because of inflated costs. Correction of these conditions cannot be dismissed as a matter of local responsibility—the fact is that it involves virtually every segment of a disorganized national economy. Not until there are some definite indications of economic stabilization can we hope for a return to effective planning and execution of public works in relation to housing demands.

Structural Aluminum Bridge

With a slightly greater depth of girder as the only concession to structural differences, a 100-ft. all-aluminum deck girder span was installed last week at Massena, N. Y., in a railroad bridge that has several steel spans of the same length and design. Admittedly, for a fixed span under normal conditions, aluminum cannot now compete economically with steel. But lack of precedent and insufficient knowledge of the action of aluminum in the field have perhaps acted as a deterrent to its use for movable bridges and similar structures where the light weight and non-corrosive properties of the metal overcome its cost differential. It is to supply this knowledge and confidence that the Aluminum Company of America has carried its long-time pioneering of uses of aluminum into the bridge field. A precedent for such full-scale testing by a manufacturer was provided for electric-arc welding when the Westinghouse Company erected an all-welded truss span at its Chicopee Falls, Mass., plant in 1928. Here, every problem of welding and of designing for a new application was fully analyzed and reported. The current widespread use of electric-arc welding owes much to this pioneer bridge. It is understood that the Aluminum Company intends to subject its aluminum span to a similar searching analysis.

Must Housing Follow Meat?

Unless some drastic changes are made, the present chaotic situation with respect to meat is going to be repeated with housing. The parallels are all too plain.

First, there were appeals and subsidies to increase the meat supply. Then followed price control to "protect" the consumer. The next stage witnessed the difficulty of setting price ceilings so as to give the consumer protection without causing the producer to go broke. In the next sequence, mistakes in ceilings or inability to adjust them without long delays drove some producers out of the market. Then came the black market, and finally politics has entered the picture.

Today, we witness great pressure on the President to remove meat controls until after election. All of these steps, except this last, lowest form of politics, have been present in housing, and without question the pressure to juggle housing controls for political and not economic ends is building up. In the meantime, pitifully few houses have been completed, costs have soared and quality is shamefully low.

Theoretically, priorities and price control were proper expedients for getting housing started and spreading it equitably. Actually they have outlived their usefulness, and now constitute a brake on progress. Particularly is this true of price control which has made such items as nails, reinforcing bars and hardwood flooring uneconomic to produce.

Drastic as it may seem to housing officials, they should give immediate thought to seeking permission for quick and complete abandonment of price control as one of their tools. Only by such a move can housing costs, now at black market levels, be brought down. Only by bringing costs down can a buyer's strike be averted. People want and need housing badly, but not badly enough to continue to suffer headaches in getting materials at exorbitant prices and receiving poor quality in the bargain.

Now is the time to keep housing out of politics by putting it back into the economic marketplace.

Cement Prices

In vacating the Federal Trade Commission's order to the nation's cement companies to "cease and desist" selling cement on a delivered price basis, the 7th U. S. Circuit Court of Appeals in Chicago made several significant declarations: (1) The existence of identical prices for cement at any given place is not the result of a conspiracy or an agreement in restraint of trade and competition; (2) the question as to whether the multiple basing point system of pricing is illegal rests in the legislative domain, and has never been answered there: (3) it is the inevitable result of any pricing system that cement must be sold at the same place at a uniform price, whether it be at the point of production or that of destination.

It is this third declaration that is all important to the cement user, and it is the one that has been consistently ignored by the government officials and lawyers who have enjoyed a profitable field day in batting this subject of cement pricing around for so many years. Attempting to see something sinister in identical price bids, they have sought means of eliminating them, disregarding what the result would be or what alternatives are available.

The majority opinion of the appeals court is that uniform prices for cement are "inevitable". It therefore would seem to matter little whether the uniformity resulted from adding freight rates to the mill price of a manufacturer whose mill is nearest the point of use (essentially the method now in vogue) or from some other procedure. As a matter of fact, uniform prices at any one location for standardized products are quite common, as witness sugar and wheat. Perhaps, in early days, Daniel Boone could sell bear meat near his hunting grounds in Kentucky for less than his competitors, if any, from Pennsylvania. But the development of transportation, and an excess of bear meat in Pennsylvania, soon ended Boone's monopoly. What is more to the point as respects cement, the price of bear meat in Tidewater Virginia was the same whether the bear originated in Kentucky or Pennsylvania. Transportation and marketing pressures eliminated local price advantages, and the buyer himself at distant points forced prices there to be identical.

In any event, identical cement prices are now declared to be legally arrived at. And legal or not, they are inevitable because the theoretical opportunity of a nearby mill to undersell distant mills is cancelled by the hard facts of economic life. The distant mill will meet the price so long as it has cement to sell and so long as freight rates do not eat up all of its profit. On a given job, a distant cement mill will make less profit than a nearby mill, but all jobs are not distant. A "distant" mill on one job is a "nearby" mill on the next. When it is a "nearby" mill it can pretty well fix its selling price, of course, but the higher it sets it the more distant competition it invites.

The crux of the matter is that there is competition in the cement industry that tends to keep cement prices down to a certain level, but none that permits variable prices. This absence of complete price competition has one disadvantage in that it reduces the incentive for the cement companies to improve their manufacturing practices in order to achieve lower costs, although even here incentive is not entirely lacking since each reduction in manufacturing costs permits any given mill to increase the territory in which it can sell at a profit. And on the credit side of the ledger, so far as the user is concerned, uniform cement prices for any given job, provide him with assurance that no one is able to outfigure him on a bid because of an advantage in cement costs.

But despite identical cement prices, or more properly as a result of them, the cement companies produce a maximum of competition in the services that they seek to render their prospective customers. In these services, in the competition offered by competing construction materials and in the desire of cement companies to widen their sales territories rest the principal hopes of the consumer for lower cement prices. These are based on the laws of economics, and no man-made law or restrictions can replace them. That in effect is what the decision of the U. S. Circuit Court emphasizes.

ENGINEERING NEWS-RECORD

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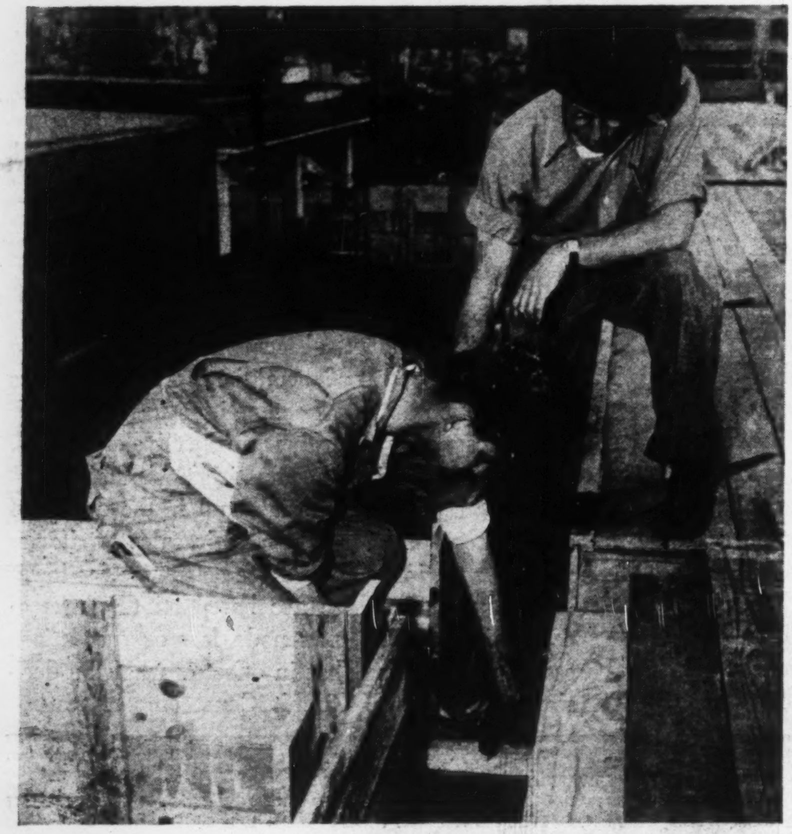
Skilled Help for Construction

Carroll Griffin **H. M. Crawford**

Secretary and Chairman, respectively, of the Atlanta, Ga., Carpentry Joint Apprenticeship Committee

Editor's Note—*Skilled and productive manpower is the most important factor in obtaining economical construction. To provide this type of manpower calls for an effective apprentice-training program since there was little opportunity during the war years to develop replacements for retiring craftsmen. How this training is being done to meet the need for carpenters in the Atlanta area indicates a realistic approach to the problem. As described in this article, written by a construction contractor and a union officer, a joint apprenticeship committee formed by contractors and a union local serves as the employer's agent and training institution for new workers. The committee directs apprentices to those contractors who can best provide training, and also assists in job shifts to assure diversity of work operations.*

AN OUTSTANDING apprentice training program is under way at Atlanta, Ga., to provide ample and competent construction workers for that area. Typical of the industry-wide activity is the four-year training program of the carpenters under which 175 apprentices are now employed and more than 75 contractors are taking part.



Proper use of a hammer in tight places is included in apprenticeship instruction

The training program is supervised by the Atlanta Carpentry Joint Apprenticeship Committee, a cooperative project of contractors' and carpenters' unions assisted by federal and state apprenticeship agencies. The training program was initiated in March, 1945, but, because of scarcity of young men and inactivity of the building industry, it did not get well under way until after the war. The return of servicemen to civilian life has made available an ample supply of prospective apprentices and at least 90 percent of those now in training in Atlanta are veterans.

Committee selects apprentices

Among the wide variety of duties of the joint committee is the selection of apprentices for training. The committee interviews and examines every applicant for a job as an apprentice and arranges for his employment by a contractor. Before starting his training, each apprentice is indentured to the committee, which serves as employer's agent. An apprenticeship agreement is signed by both the apprentice and a representative of the committee and is officially registered with the Federal Committee on Apprenticeship. (In states in which an apprenticeship agency is established, apprenticeship agreements are registered with that agency of the state government.

The signing of the agreement by the committee representative does not imply that the committee actually employs the apprentice, for he is employed by a contractor. It does, however, obligate the committee to use its influence to keep the apprentice employed during his full term of apprenticeship. If the first contractor hiring the apprentice is unable to employ him over the entire apprenticeship term and give him the diversified experience and instruction needed to equip him for all-round craftsmanship, the committee transfers the apprentice to another contractor.

When an apprentice has satisfactorily completed his full term of apprenticeship he is awarded a Certificate of Completion of Apprenticeship. In Georgia, the certificate is issued by the Federal Committee on Apprenticeship. Again, in states in which an apprenticeship council has been established certificates are issued by that state agency.

Committee is a "training institution"

Not only does the Atlanta Carpentry Joint Committee serve as "employer agent" but it is recognized as an approved "training institution" under the "G. I. Bill" by the Georgia Education Council, the agency designated by the governor to approve establishments employing veterans.

Nationally, recognition of such joint committees as training institutions was made by General Bradley of the Veterans Administration who commented that while such committees are not actually giving education they are performing such a function by aranging for training with business establishments that are adequately equipped and staffed to provide a complete and well-rounded course of instruction.

Giving the committee this status eliminates the need for each contractor who employs veterans as apprentices to obtain official approval. Each contractor is automatically approved when the committee has been certified by the state agency and the names of the contractors are made known to that agency.

Four years of training

The Atlanta carpentry apprenticeship program follows closely the state and national standards of apprentice training for the carpentry trade. These standards have been developed and approved by the Associated General Contractors of America and the United Brotherhood of Carpenters and Joiners of America.

The term of apprenticeship is 8,000 hours, about four years of supervised work, plus 144 hours a year of related classroom instruction.

TABLE I—HOURS OF SUPERVISED WORK REQUIRED, ATLANTA CARPENTRY APPRENTICE PROGRAM

	Hours
A. Concrete construction	
Foundations	240
Columns	480
Walls	280
Flat slab	200
Beam and girder	480
B. Laying out building & footer lines	
Establishing lines	120
Establishing elevations	120
Erecting batter boards	80
C. Framing	
Sills	120
Floor and ceiling joist	120
Partitions	120
Sheathing wall, roof and sub floor	40
Partitions and openings	200
Stair framing	200
Scaffolding	80
D. Framing roofs	
Common hip to jack rafters	240
Roof with double pitch	240
Building dormers	80
E. Framing and building roof trusses	120
F. Exterior finish	
Cornice siding and corner board	240
Roof covering	80
Door and window frames	200
Porches	160
G. Interior rough work	
Partitions and ceiling joist	160
Grounds, walls, doors and windows	320
H. Finishing	
Fit and balance sash in frames	80
Case windows and doors	240
Assemble door and window jambs	200
Finish cabinet work	240
Stair and balustrades	240
Laying finish floor	80
Moulding and other trim	320
Fitting and hanging doors	240
Placing hardware	200
I. Working with metal trim	80
J. Saw filing	200
K. Operating woodworking machinery	
Cut-off, rip and band saws	320
Rabbiting and dado moles	320
L. Wood inter-locking joints, sharp	320
M. Plastics, metals and other new materials as they effect construction industry	200
Total	8,000

As stated in the written apprenticeship plan, each carpenter apprentice receives "such instruction and experience in all processes of the trade . . . as is necessary to develop a practical and skilled mechanic versed in the theory and practice of carpentry work." The schedule of work processes in which each apprentice is trained is shown on Table I.

In the classroom work, which is given in local public vocational schools, apprentices are taught the theoretical aspects of the trade. Included in the curriculum are blueprint reading, mathematics, physics and other sciences related to carpentry, as well as such subjects as safety rules and regulations, workman's compensation and employer-employee relations.

Those with previous experience in carpentry are granted credit for that experience and given a higher status, thus enabling them to receive a higher wage at the start and to complete their training ahead of the regular schedule. This credit has proved to be very advantageous to veterans as a large percentage of them have had some work experience in the trade either during or before military service.

Wages and allowance

Under the program, an apprentice is paid by his employer not less than the percentage of the journeyman rate shown in Table II.

Veterans who are accepted for apprentice training receive in addition to the apprentice wage a monthly subsistence allowance from the government under the "G. I. Bill". The allowance amounts to as much as $65 a month to an apprentice without any dependent, and $90 a month if he has one or more dependents. The total an apprentice may receive in wages and government allowances may not exceed $175 per month for a veteran with no dependents or $200 with dependents under a recent amendment to the law.

Keep simple records

Keeping a record of the progress of each apprentice as he moves from one period of his training to another is a task involving considerable detail. The work, however, has been made comparatively simple by maintaining a current record of each apprentice on

TABLE II—PERCENTAGE OF JOURNEYMAN'S RATE RECEIVED BY APPRENTICE

		Percent			Percent
First	1,000 hours	45	Fifth	1,000 hours	72
Second	1,000 hours	56	Sixth	1,000 hours	76
Third	1,000 hours	60	Seventh	1,000 hours	80
Fourth	1,000 hours	64	Eighth	1,000 hours	88

Apprentice learns safe use of portable power tools from a competent foreman.

three record forms: the apprentice's *Identification Card*, his *Weekly Work Process Report Card*, and the *Master Record Card.*

The *Identification Card*, which is renewed periodically, gives the name, the period of apprenticeship to which the worker has progressed, and the work processes in which he is to be trained during the next period. With this information, the employer may see at a glance the status of the apprentice, the kind of work in which he requires experience and training and his pay rate during the current period. The card is renewed at the end of each 1,000-hr. period.

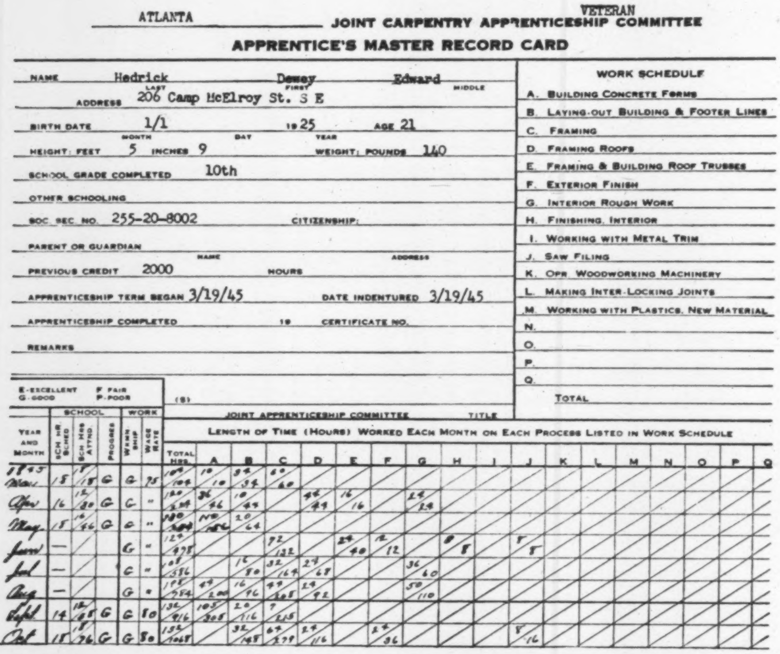
The *Weekly Work Process Report Card* is given to every apprentice. One side of the card provides space for the hours spent on the job daily on each type of work in which the apprentice is trained. This data is filled in by the apprentice and checked and signed at the end of the week by the foreman who instructs the apprentice. The other side of the card gives the attendance and grades in classroom work and is filled in by the school instructor.

The *Master Record Card* contains all the data on the apprentice relating to his progress during each week of his entire term of apprenticeship. The data contained on this card is that given on the other two forms, including credit for past experience, comments by instructors, and other pertinent information.

Comparison of the total hours worked under each classification, kept up-to-date on the *Master Record Card*, with the requirements of Table I show immediately the work a man must have to complete well-rounded training as a carpenter. The several agencies work together under the Atlanta Carpentry Joint Apprenticeship Committee to see that each man has an opportunity to complete the required training.

Experienced supervision

Cooperating with and serving as consultant to the apprenticeship committee is a representative of the Atlanta office of Apprentice-Training Service, Charles A. Britton, who assisted in establishing the program. The employer members of the committee, who represent the Georgia Chapter of the Associated General Contractors of America, are Carroll Griffin, chairman (president, Griffin Construction Co.); Edward Van Winkle (president, Van Winkle Co.); and C. R. Justi (president, Justi Construction Co.). The labor members of the committee, representing the United Brotherhood of Carpenters and Joiners of America, L.U. 225, are H. M. Crawford, committee secretary; O. M. Harper, co-chairman; and W. Lee Sorrells, Jr.



ATLANTA VETERAN JOINT CARPENTRY APPRENTICESHIP COMMITTEE

APPRENTICE'S MASTER RECORD CARD

NAME Hedrick (LAST) Dewey (FIRST) Edward (MIDDLE)
ADDRESS 206 Camp McElroy St. S E
BIRTH DATE 1/1 (MONTH, DAY) 1925 (YEAR) AGE 21
HEIGHT: FEET 5 INCHES 9 WEIGHT: POUNDS 140
SCHOOL GRADE COMPLETED 10th
OTHER SCHOOLING
SOC. SEC. NO. 255-20-8002 CITIZENSHIP:
PARENT OR GUARDIAN (NAME) (ADDRESS)
PREVIOUS CREDIT 2000 HOURS
APPRENTICESHIP TERM BEGAN 3/19/45 DATE INDENTURED 3/19/45
APPRENTICESHIP COMPLETED 19 CERTIFICATE NO.
REMARKS

WORK SCHEDULE
A. Building Concrete Forms
B. Laying-out Building & Footer Lines
C. Framing
D. Framing Roofs
E. Framing & Building Roof Trusses
F. Exterior Finish
G. Interior Rough Work
H. Finishing, Interior
I. Working with Metal Trim
J. Saw Filing
K. Opr. Woodworking Machinery
L. Making Inter-Locking Joints
M. Working with Plastics, New Material
N.
O.
P.
Q.
TOTAL

E-EXCELLENT G-GOOD F FAIR P-POOR

(S) JOINT APPRENTICESHIP COMMITTEE TITLE

Year and Month	School: Sch. Hr. Sched.	School: Sch. Hrs. Attnd.	School: Progress	Work: Wkmnship	Work: Wage Rate	Total Hrs.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1945 Mar	15	15/15	G	G	75	104/104	10/10	34/34	60/60														
Apr	16	12/30	G	G	"	120/224	36/46	10/44		44/44	16/16		24/24										
May	15	16/46	G	G	"	130/354	110/156	20/64															
June	—			G	"	124/478			72/132		24/40	12/12		8/8		8/8							
Jul	—			G	"	108/586		16/80	32/164	24/68			36/60										
Aug	—			G	"	198/784	44/200	16/96	44/208	24/92			50/110										
Sept	14	12/58	G	G	80	132/916	105/305	20/116	7/215														
Oct	15	18/76	G	G	80	152/1068		32/148	64/279	24/116		24/36				8/16							

The Master Record Card has space for recording each month's activity for four years of apprenticeship. It is held, and kept up to date, by the Atlanta Joint Carpentry Apprenticeship Committee.

Highway to Transform Bolivia's Economy

J. L. Harrison
Principal Highway Engineer, Public Roads Administration
Washington, D. C.

Contents in Brief: *To connect the agriculture, oil-producing, and mining regions of Bolivia, and thereby unite that country economically, a 305-mi. highway is being constructed to join the towns of Santa Cruz and Cochabamba. A special development corporation with broad powers was created to finance the project and a comprehensive long-range program calling for large oil and agriculture developments was adopted. Long haul distances, lack of local building materials, and shortage of construction equipment are problems placing a heavy burden on the engineers supervising the highway.*

A $12,000,000 project now under way to provide a first class highway between the towns of Cochabamba and Santa Cruz in Bolivia is the major part of a program that will completely transform that country's economy. Once the road is in service, importation of large quantities of food supplies will be unnecessary, the oil resources of the country may be developed and Bolivia can be transformed into a united republic. These benefits will be so great as to make this 305-mile project easily the most important road construction job now under way throughout the world. The method of financing the program and the difficult transportation problems being overcome in delivering construction supplies add significance to the work.

To understand the importance of the highway, the geographical situation and present economy of Bolivia must be studied. Bolivia has an area of over 500,000 sq. mi., or more than ten times that of the state of New York. Roughly a third of Bolivia is mountainous and high plateau country that is cool and relatively healthful. The balance is low, hot, humid, unhealthy territory, most of which is in the upper Amazon valley.

More than two-thirds of Bolivia's 3,500,000 people, many of whom are Indians, live on the upland area, the Altiplano. In the mountains, which occupy a considerable part of this area, are located numerous tin mines where the greater portion of those that work for wages are employed. The arid condition and high altitude of much of this region (13,000 to 15,000 ft. above sea level) allow little food to be produced.

Out of these circumstances a badly unbalanced economy has developed. Owing to the demand for the metals mined there, the population of the Altiplano tends to increase faster than food production. On the other hand, large areas where rice, sugar, and corn can be produced are available in the lowlands. However, production there has increased little during recent years because of the limited local demand and the impossibility of transporting food at reasonable rates to the Altiplano or to other markets. The result is that Bolivia, although having within its borders a food production potential far in excess of the needs of its present population, must import food in considerable quantity.

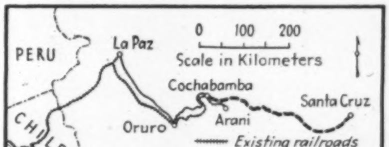


Fig. 1. ***Extending from Cochabamba to Santa Cruz (heavy dotted line), the project underway will permit oil and agricultural products to be transported economically from the Santa Cruz area to the capital city of La Paz and its neighboring mining regions. Machinery and materials imported for the job must be delivered at the Pacific port of Arica, Chile, and transported by rail to the town of Arani, east of Cochabamba.***

Oil is another major factor in Bolivia's economy. On the Altiplano, only limited coal and oil supplies have been developed and water power is greatly lacking. In contrast, Bolivia has adequate oil in the lowlands for all present needs and for prospective requirements for years to come, according to informed opinion. But because transportation facilities between Altiplano and the west coast of South America are reasonably adequate, whereas facilities between the Altiplano and the oil fields in the foothill areas to the north and east are all but nonexistent, Bolivia now imports oil to maintain production in its mines.

Reduced to its simplest terms, Bolivia's economy is based on mining. Products must be exported to provide the exchange used in purchasing the required imports. In years when the demand for tin and other mine products is good, sufficient foreign exchange is available to import food, fuel and a reasonable volume of manufactured articles. When demand for the products of the mines drop off, the quantity of food and manufactured articles which can be purchased abroad slumps and large portions of the Bolivian population are forced to exist on definitely inadequate rations.

Development corporation organized

In an effort to deal with this situation on a national basis, Bolivia is working on one of the most interesting programs any nation has ever undertaken, and as this is written the prospects of real accomplishment are most encouraging. The plan is largely the outgrowth of the work of an economic mission sponsored by the U. S. Department of State. Following that mission's report, negotiations between this country and Bolivia resulted in the organization of the Bolivian Development Corporation (Corporacion Boliviana de Fomento), which has charge of the execution of the plan. These negotiations also established a financial basis on which to found the corporation's operations. Part of the money the corporation has at its disposal was made available by Bolivia from ordinary revenues. Other large sums are to be borrowed from the U. S. Export-Import Bank (*ENR* July 26, 1945, vol. p. 88).

Transportation is key

While the corporation's long-term plan includes other things and many details, its basic immediate objectives are: (1) improvement of the transportation facilities of Bolivia; (2) an important increase in agriculture in the highly fertile lands in the neighborhood of Santa Cruz (a town of some size just to the east of the Altiplano); (3) development of the country's oil resources, which lie along the foothills where the valley land and the Altiplano meet; and (4) organization of facilities to provide for marketing livestock produced in the Beni (the part of the upper Amazon valley that is in Bolivia), an excellent cattle country where slaughterhouses and cold storage facilities are now being constructed. Until highways can be used, the fresh meat will be delivered to cities on the Altiplano by air transportation.

In the long run, success in the development of an increased food supply and intensified production of the Bolivian oil fields will depend on transportation. The first step to improve land transportation facilities will be the construction of a good highway from Cochabamba to Santa Cruz, a distance of 305 miles.

Even before any thought was given to the organization of the corporation, it was well recognized that the development of a better balanced national economy would depend on the construction of more adequate land transportation facilities. The problem has been to meet the cost of this work. The Altiplano is not a smooth plateau but is rough, high and mountainous, with steep slopes to the valley areas.

These conditions make for expensive construction across the Altiplano and from the plateau to the valley lands—construction which seems especially expensive to a people many of whom must live on a monthly wage less than the daily wage of a skilled mechanic in this country. It is estimated that the Cochabamba-Santa Cruz road will cost $12,000,000, or about $4 for every citizen of Bolivia. Although this sum is not particularly impressive to Americans, to the average Bolivian laborer the amount is huge indeed.

The importance of this observation lies in the light it throws on why Bolivia has so little highway built to modern standards. The expenditure such developments require is so much more easily understood than the general economic benefits expected to result that officials have hesitated to promote extensive highway programs. In most countries the solution has been to construct, from year to year, short sections of improved highway that created, even as isolated sections, obvious benefits that the public recognized.

Then as the years passed, these more or less isolated sections were connected with the ultimate result that through roads and finally well balanced highway networks resulted. Essentially that is what has been done in the United States over the past 30 years and is now being done in several Latin American countries.

Bolivia has peculiar problems

But such a plan does not offer a solution to Bolivia's problems. This condition prevails both because the geographical distribution of the population does not lend itself to highway development on this pattern and because highway expansion in this way would not meet Bolivia's needs adequately from the economic standpoint. In short, construction of only a few isolated short sections of modern highway would not be justified in Bolivia at this time. Therefore, the conclusion has been reached that good trunk lines must be developed in their entirety, one at a time, and the first one selected has been the road from Cochabamba to Santa Cruz.

A road of sorts is now available between these two points, but it is entirely inadequate by modern standards. In building a first-class highway it has been decided to use the old right-of-way wherever possible. But since modern highway construction involved improved alignment and better gradients than were thought necessary when the older route was laid out, the new line will depart from the old in many places.

Location of the new road has been and continues to be a difficult problem. No topographical maps such as those the Geological Survey provides for use in this country are available. Moreover, even those people living in the area traversed have little knowledge of the topography of its mountainous areas.

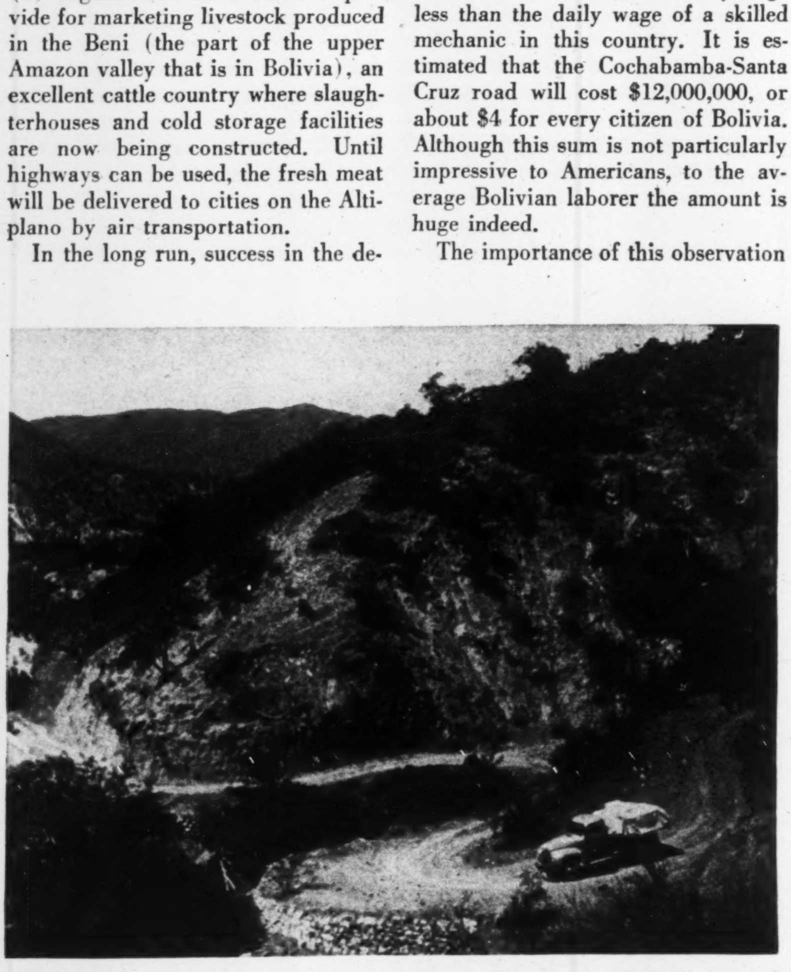


Fig. 2. Because of the rugged terrain traversed, improvement of the present inadequate road will be expensive and will require extensive grading.

As a result, extensive reconnaissance work is necessary before a decision can be reached as to which of several routes is best. Frequently reconnaissance parties have, for long distances, examined as many as five of six possible lines before the best could be determined. Even then it has often been necessary to run preliminary surveys over two or three alternate lines before a final decision on location could be made. The cost of preliminary work of this kind is high, but it results in a better line and keeps the earthwork as low as possible, which reduces the overall cost.

Corporation purchases equipment

The principal construction contract for the new road was awarded to Compania McGraw-Warren, S. A., in July of last year (*ENR* July 26, vol. p. 88) and good progress is being made with a crew of about 400 men. At present, the contractor's most severe problem is that of obtaining equipment, which is being furnished by the Bolivian Development Corporation.

In the United States this arrangement would probably be illogical. But for the Bolivian project the plan is quite logical. Little construction equipment is available in Bolivia, so it must be purchased abroad. If the contractor imports his own machinery he would probably be faced with the choice of paying the high freight two ways or abandoning much of it when the work is finished, as little local demand exists for certain types of roadbuilding equipment. On the other hand, the Bolivian Development Corporation has agricultural and oil development projects under way and plans additional highway construction as soon as the Santa Cruz road is finished. Therefore, it was considered best for the corporation to purchase the equipment.

But the corporation, like other purchasers, is having difficulty in obtaining roadbuilding machines. Some used units have been sent to Bolivia and a good deal of new equipment has been ordered, some of which has been received. So far, however, these operations have fallen considerably short of providing the contractor with adequate equipment.

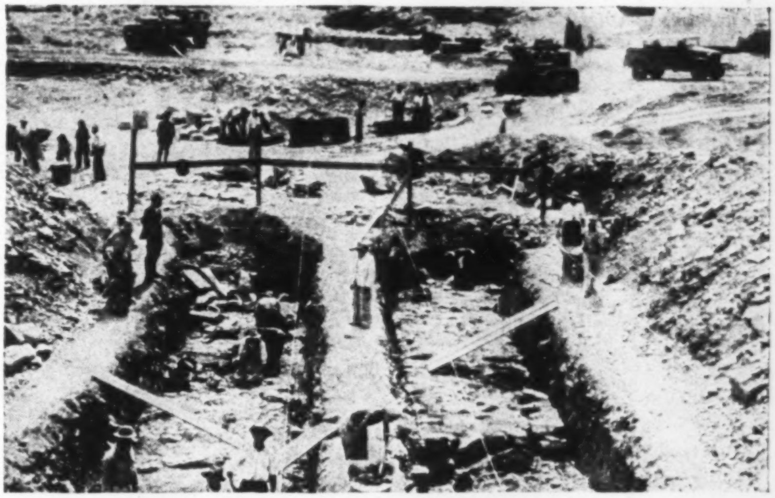


Fig. 3. In building the many culverts and small bridges required, masonry construction with local stone is used to the greatest extent possible. Construction of a double box culvert is illustrated.

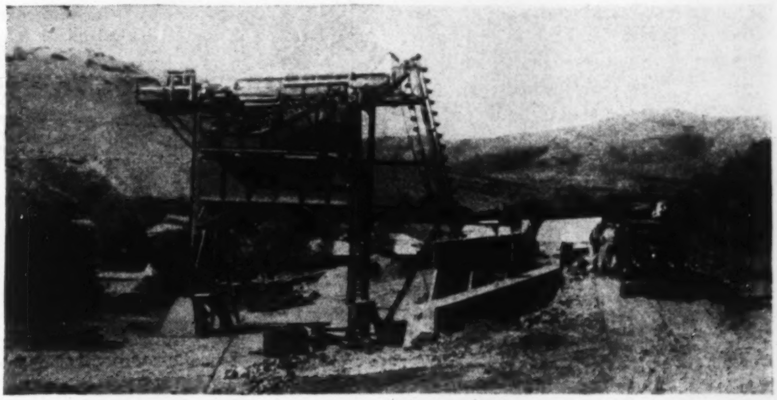


Fig. 4. Large amounts of American-built construction machinery, including screening plants of type shown above, are being imported for the project, as little roadbuilding equipment is available in Bolivia at present and none is manufactured in that country.

One reason for this condition has been that many used units in good condition when they left this country arrived at Cochabamba in unserviceable condition. Enroute to South America, carburetors, batteries, starting motors, headlights, and even grease cups were removed, in fact, almost anything that could be disconnected and carried away.

Just where these essential-to-operation items were taken off no one has been able to learn, but as a result of their removal most of the used equipment had to be laid up on arrival for delivery of replacement parts, which takes a long time. To partially overcome this problem and to speed up repairs in case of breakdowns, shops for making many parts and for repairing or rebuilding the old ones have been set up.

The new road is being constructed from the Cochabamba end. Despite the equipment shortage, good progress is being made. However, difficult problems lie ahead.

The railhead for the project terminates some 35 miles east of Cochabamba and at the town of Arani and from there to Santa Cruz supplies must be hauled over the road. This procedure requires that as construction advances everything the contractor uses must be transported an increasing distance from the railhead until the maximum haul approaches 280 miles. Although the maximum gradient is restricted to seven percent, with minor exceptions, grades on the new highway will be long. True, the prevailing haul will be downhill, but out of Cochabamba there is a climb up to a pass 13,000 ft. above sea level. At least two other passes are almost as high.

Therefore, while the major part of the distance over which materials must be hauled involves downhill travel, loads will be limited by the uphill pulls. Also, the high altitude will affect the project to a much greater extent than would be normal on most jobs in this country. Under any condition, keeping a job moving when everything has to be transported some hundreds of miles involves management of a high order. On the Bolivian project, excellent management will be required if the work is to progress satisfactorily. Fortunately, the job seems to have it.

With present plans, the completed road will have a surfacing five meters wide and one-meter shoulders. The base will be of macadam, crushed gravel, or plain gravel, depending on the material available within a reasonable length of haul. One would naturally expect that on a project built for much of its length through high mountains the development of adequate supplies of hard stone would be a simple matter.

This is not at all the case. Plenty of rock is available but most of it is soft. In fact, a large part of the surface rock appears to be sedimentary. Where erosion has cut through the sedimentary cap, hard rock can be obtained, but places where satisfactory rock has been exposed in this manner occur less frequently than desired. Hard, coarse gravel is available in most of the stream beds, indicating that hard rock exists near the headwaters. However, these sources are generally either so distant or so inaccessible that their development is impractical. In such cases crushed gravel will be used or, if the average size of that available is not too large, a plain gravel base will be used.

Choice of asphalt important

The surfacing, as presently planned, will be a 2-in. bituminous top. Several types are under consideration, not in an effort to determine that most desirable from a purely technical standpoint, but to make certain that the type selected can be constructed at the lowest cost consistent with satisfactory service under Bolivian conditions. As a matter of fact, since most of the region through which the road passes is dry or with a rainfall below 15 in. annually, several types of surfacing might be expected to give satisfactory service.

However, different types of surfacing require the use of various types of equipment and labor of different degrees of skill. The seemingly logical plan would be to select an asphalt requiring the least highly skilled labor and minimum importation of expensive and complex equipment. However, these factors are not the most important, for skilled labor could be developed and machinery imported.

The real problem is in determining the more economical type of asphalt to use. From whatever point asphalt is shipped most grades must be packed in steel drums. This requirement adds appreciably to the original cost and somewhat to the freight. Asphalt in drums costs from 13 to 15c. a gallon delivered at a port on the west coast of South America depending on the grade of material and the weight of the drum involved.

Asphalt in drums can be reshipped readily by rail from Arica, which is a port on the west coast of Chile, to Cochabamba and moved to the point of use on the highway by truck. But by the time it reaches Cochabamba it has cost from 21 to 22c. a gallon, and upon arrival at the desired location on the job, which will require an average haul of about 150 miles over the highway, its cost will have increased to over 25c.

As compared with these costs, if a type of surfacing requiring a cutback such as RC-2 is selected, the cost of bulk cutback on the Pacific coast would be 7c. a gallon cheaper than asphalt in drums. But, to use cutback

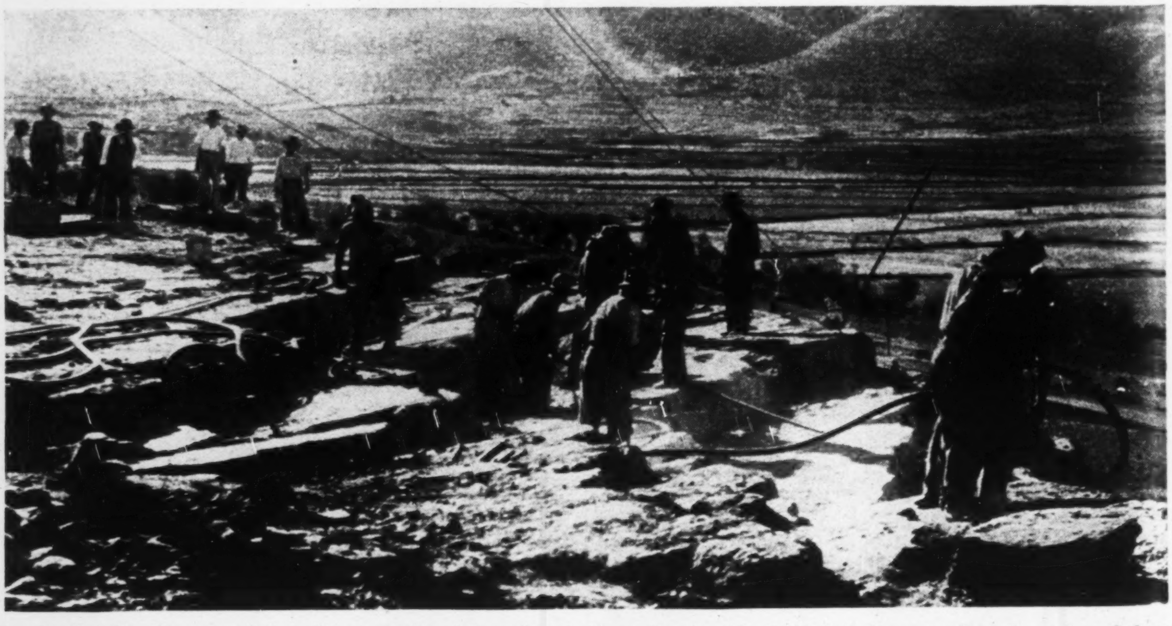


***Fig. 5.* Despite the rugged terrain encountered for almost the entire length of the job, few supplies of good rock have been located. At this quarry American-built pneumatic tools are being used to produce stone for construction of some of the many masonry culverts and bridge foundations.**

in bulk, it is necessary that it be removed to Cochabamba in tank cars of which few, if any, are available in Bolivia. For such a large project it might be desirable to purchase tank cars, as they would be useful for other purposes after the job is finished. However, the investment for the 30 cars required would be great. Also, considerable storage space at the railhead would be needed. Therefore, these and a good many related problems must be worked out before a final decision is reached as to the best type of surfacing.

To summarize, except for the long haul difficulties, the engineering problems encountered on the Bolivia project are not particularly unique. But the combined problem emphasizes the fact that foreign projects present many difficulties with which American contractors who have never worked abroad are unfamiliar or which, if not different from those encountered here, do have a greater effect on production, progress and cost. Often a job simple and easy to handle in this country proves difficult and expensive abroad because of those conditions that are making the Cochabamba-Santa Cruz job difficult and will make it more so as operations progress outward from Cochabamba.

Road must be finished

However, regardless of the construction difficulties this road presents, the Bolivian highway must be finished, for it is the vital link in an important plan and the economic future of Bolivia depends on its early completion. When it is finished agriculture in the Santa Cruz area will be profitable, oil development can proceed on a sound basis, and the whole economy of Bolivia will be greatly improved. Without completion of the road the other major parts of the important program for Bolivia will fail.

Fortunately, the execution of the entire plan is in the hands of able far-sighted men believing in and understanding the importance of the program. The majority of these men are Bolivians. The progress they have made in solving the difficulties the war created—difficulties not yet by any means fully eliminated—justifies confidence that the program will be carried to a successful conclusion.

Location of the road, as well as all surveys and the preparation of detailed plans, is being handled by the Public Roads Administration. Construction is supervised by engineers employed by the Bolivian Development Corporation.

Western Cities Plan Sewage Disposal Work for Postwar Projects

An ever-increasing number of western communities are joining the block whose postwar construction plans place an emphasis on sewage disposal projects. To date, most of the projects are still in the planning stage, although a few cities have awarded contracts for sewage disposal systems.

Newest developments in sanitation control include the award of $7,349,806 in contracts by the Los Angeles board of public works for a proposed plant at Hyperion, Calif. One, for $3,494,088, went to Peter Kiewit Sons Co., Arcadia, and Construction Aggregate Corp.; another, for $3,517,410 to the Guy F. Atkinson Co. The former is for excavation and disposal of 14,100,000 cu. yd. of material at the site of the proposed activated sludge treatment plant; the latter for the Hyperion outfall sewer.

Contracts, bids and bond issues

In Redding, Calif., a $208,033 contract was awarded to J. P. Brennan, Redding, for a sewage disposal unit, and in Ogden, Utah, a contract for $68,863 went to the Wheelwright Construction Co., Ogden.

In the bid-letting stage are projects in Tacoma and Puyallup, Wash. Tacoma citizens have voted $3,000,000 for sewer improvements, and $60,000 worth of projects have been bid upon. Puyallup will pay approximately $700,000 for a sewage system.

Voters in two western cities, Dallas, Ore., and Davis, Calif., have approved bond issues for sewage projects in the next step down in the construction sequence. Dallas citizens voted a $150,000 issue for construction of a municipal treatment plant and storm sewers. Davis voters endorsed a $220,000 issue for improvements to the city water and sewer systems.

The California Allocations Board out of a $90,000,000 state public works fund has approved $681,603 for enlargement of the Richmond-Sunset sewage treatment plant in San Francisco and, subject to final checking, for storm drains on Santa Barbara avenue in Los Angeles.

In Seattle, Wash., the city engineer has asked city council authorization of the sale of $1,000,000 in bonds to finance sewage work.

Plans have been approved by city officials for a $22,456,000 sewage plant and system in Metropolitan Oakland, Calif., to serve Oakland, Berkeley, Alameda, Piedmont, Emeryville and Albany, and promotional work on a bond issue has begun.

Plans have been completed for a $3,700,000 project in Spokane, Wash. In preparation are specifications for a Reno and Washoe county, Nev., system to cost about $1,693,000, enlarging the city's present plant and constructing a county sewage disposal plant east of Hubbard field to serve a 15-square mile area. Also in preparation are plans for a new sewage system for Marysville, Calif., and for a $234,000 plant at Hanford, Calif.

Funds for planning

Advance planning funds have been granted by the Bureau of Community Facilities of the Federal Works agency to 11 western cities.

Approved were funds for six California cities: Arbuckle, advance planning funds $4,780, estimated cost of project $106,740; Fillmore, advance $5,500, estimated cost $257,000; Hemet, advance $1,725, estimated cost, $125,700; Indio, advance $7,118, estimated cost $177,723; San Jacinto, advance $4,550, estimated cost $99,248; Vista, advance $3,087, estimated cost $70,920.

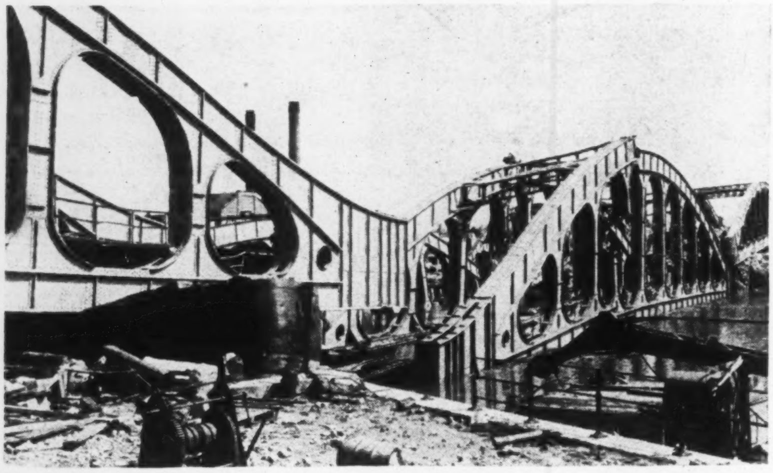
Funds for three Arizona cities were granted: Coolidge, advance $12,500, estimated cost $293,500; Tolleson, advance $6,580, estimated cost, $170,750; Yuma, advance $7,500, estimated cost $250,000. Also released were funds for Tularosa, N. Mex., advance $2,700, estimated cost $78,200, and American Fork, Utah, advance $9,800 and estimated cost $313,000.

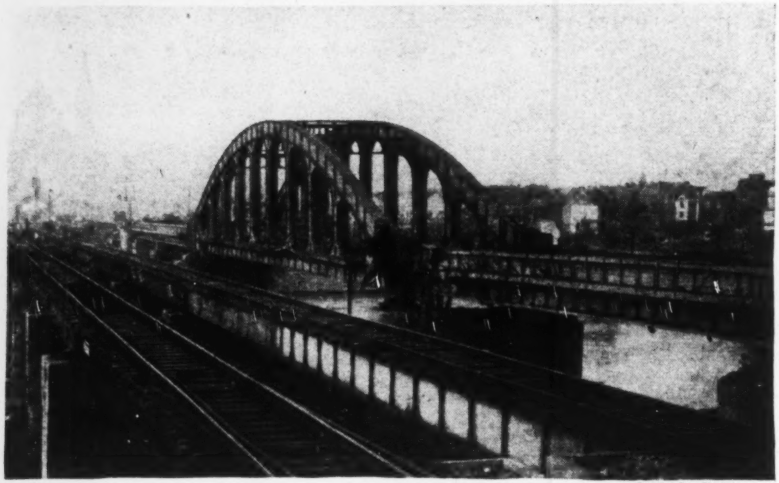
Bridge Rebuilding An Old Story To Belgian Engineers

ALL OVER EUROPE rebuilding wrecked bridges is one of the most difficult and necessary reconstruction measures that have to be undertaken. If there can be said to be any favorable aspect of the problem, it is that the engineers have accumulated considerable experience in this type of work. Nowhere is this more true than in Belgium which first saw its bridges go down before the German advance westward in the summer of 1939.

At that time 510 railway and 880 highway bridges were demolished or seriously damaged. Many were rebuilt, some temporarily and some permanently, during the enemy occupation, only to be destroyed again by Allied bombing or in the battles that followed the D-day invasion in 1944.

C. F. Lemaire, former manager of the permanent way, Belgian National Railways, has supplied some information and photographs of the early destruction and rebuilding, which emphasize the kind of problems that again face the Belgian engineers in 1946.





ENR Staff Photo

Fig. 1. Val-Benoit Bridge over the Meuse at Liege as it appeared after its destruction in 1940 (above) and as it was reconstructed (below). The split in the ends of the arched chord was caused by a buzz bomb in 1944.

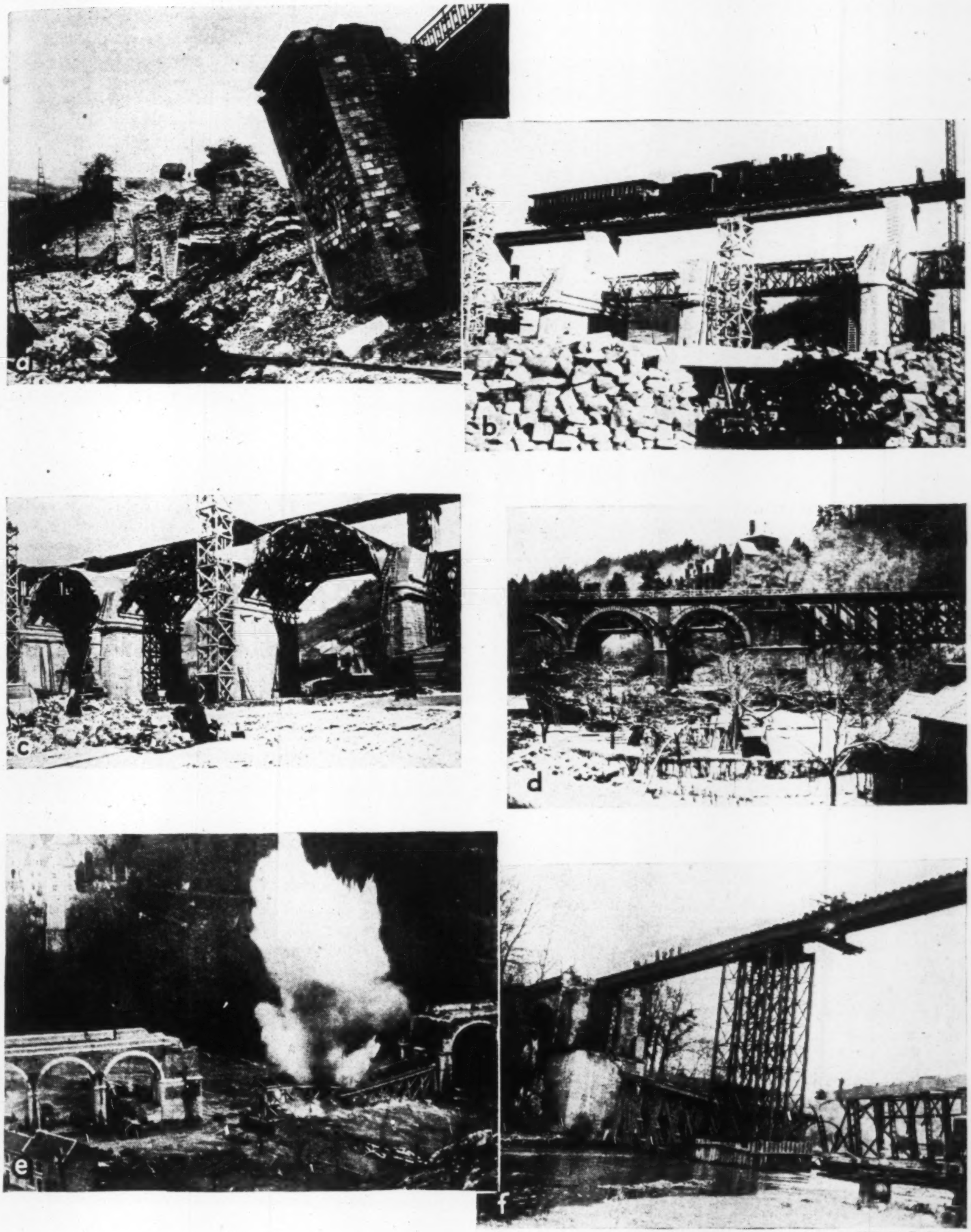
Replacing a Vierendeel truss

One of the large railroad bridges destroyed in 1939 was a double track crossing of the Meuse River at Liege known as the Val-Benoit Bridge. Its three Vierendeel truss spans of 283, 215 and 215 ft., were dropped by the explosion of mines set by the Belgian army engineers, with the result shown in Fig. 1. Bridge members hit directly by the explosion showed a fracture without any contraction in area, but outside the zone broken by direct hits, the mild steel proved to be a strong and ductile material, some plates being bent up to 180 deg., some members being badly buckled and many rivet holes stretched.

Preliminary to reconstruction, the bridge spans were cut up by oxyacetylene torches and pulled out of the river. The central 283-ft. span was then re-erected on the old piers and connected to either shore by plate girder spans as shown in the lower view of Fig. 1. This bridge was left intact by the retreating Germans in 1944, but during the time that Liege was occupied by American army forces a V-1 buzz bomb clipped one end of the main span, splitting the arched top chord. Until the damage could be repaired, railroad traffic had to be diverted from the bridge onto the plate girder bridges erected alongside. Meanwhile it was possible to use the Vierendeel truss for highway traffic.

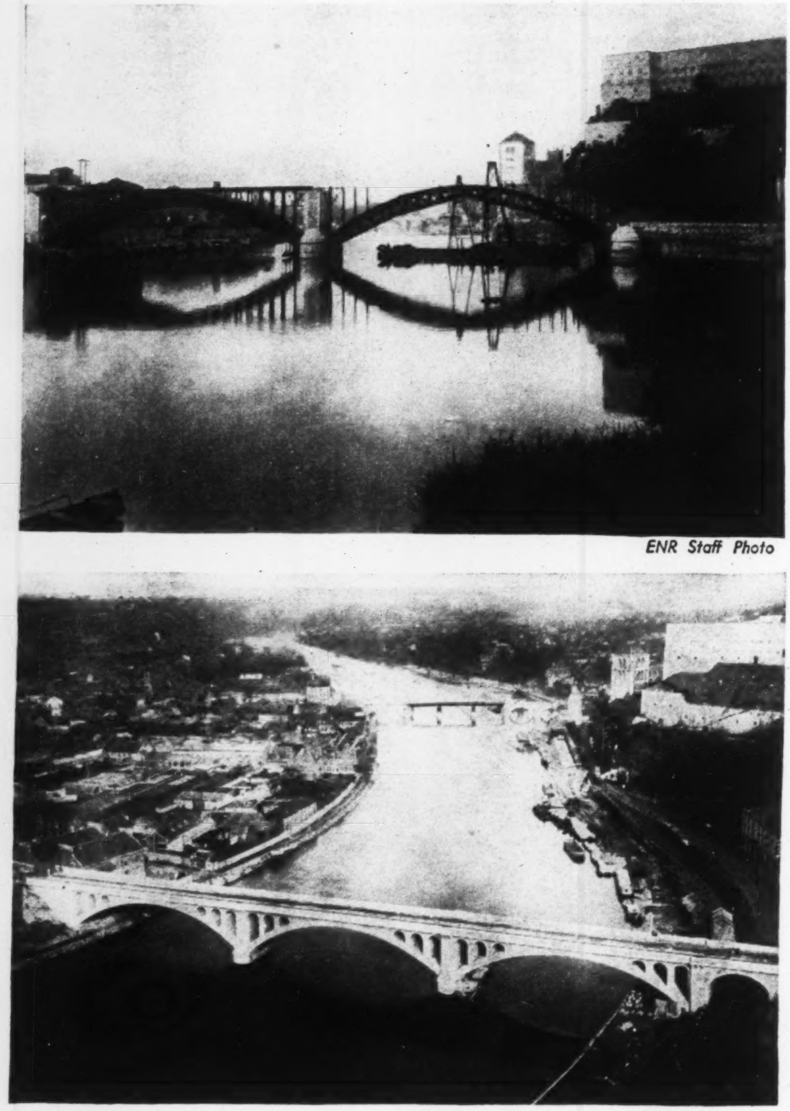
Twice-rebuilt viaduct

One of the best examples of complete destruction and rebuilding is furnished by the Remouchamps bridge in the Ardennes southeast of Liege. This bridge was composed of six 39-ft. span semi-circular arches



ENR Staff Photo

Fig. 2. Five years in the life of the Remouchamps bridge in eastern Belgium. Its masonry arches completely destroyed in 1939 (a), it was rebuilt in stages as shown in the next three photos, and then damaged again in 1944 by having the main steel span blown into the river. The blast shown in photo (e) was set off by American army engineers in order to clear the river for a temporary pier on which they erected a two-span rolled girder temporary crossing (f) in the spring of 1945.



ENR Staff Photo

ENR Staff Photo

Fig. 3. Stone bridge over the Meuse at Huy, Belgium, being rebuilt in 1940 on steel centering trusses (above) and as it appears today, having escaped damage in 1944. Downstream in this lower view is a temporary highway crossing erected on the piers of an ancient stone bridge destroyed in 1944.

of brick masonry faced with limestone, a double latticed steel truss of 197-ft. span over the small stream, and another semi-circular masonry arch of 45-ft. span.

Rebuilding of the bridge began in July, 1940, the piers and abutments being recreated in concrete faced partly with limestone rubble taken from the destroyed bridge and partly with new sandstone rubble. In order to get the bridge quickly back into service it was decided to construct a temporary single-line bridge, using only half of each pier and leaving the other half available so that permanent reconstruction could begin while traffic was maintained.

Steel girders were used for the temporary bridge, the piers being braced against horizontal forces by timber truss struts. Finally, half of the bridge was reconstructed in its permanent arch form, and rail traffic moved to this side while the other half arches were completed.

Restored to its original condition, the Remouchamps bridge again met disaster in the Battle of the Bulge in December, 1944. This time the long steel truss was dropped into the river. American army engineers replaced this truss with two 100-ft. rolled girder spans on a temporary pier in the center of the stream during the spring of 1945. Belgian engineers are now faced with the problem of replacing this temporary construction and, steel being difficult to get, have let a contract for the construction of three rubble-faced concrete arches to match the arches of the approach.

A bridge which escaped destruction in 1944 but had to be rebuilt following its destruction in 1940 is located at Huy over the Meuse River. As built in 1921, it consisted of three 168-ft. masonry arches designed to be in keeping with the picturesque surroundings, which included an ancient stone viaduct just downstream, the Huy cathedral and the old citadel that dominates the valley of the Meuse at this location.

The new viaduct was rebuilt following the same outline as the structure of 1921. The fact that stone and rubble were adopted as the building materials gave employment to many workers in the quarries situated in the vicinity and prevented them from being deported to Germany. Piers and abutments were made of concrete founded on rock and are stone faced.

The arches themselves are of stone, their thickness varying from 4 ft. 3 in. at the crown to 5 ft. 6 in. at the springing line. In 1921 the piers were sunk by pneumatic air caissons but in 1940 steel sheetpiling cofferdams were used. The stone arch spans were laid up on steel arch centering, consisting of four two-hinged trusses spaced 10 ft. apart.

These three bridges, while among the most interesting, are by no means unusual in the degree of their reconstruction. A 204-ft. concrete arch, for example, in the Renory viaduct at Liege was replaced by the steel arch centering used in its original construction, until permanent rebuilding could be undertaken (*ENR* July 12, 1945, vol. p. 29). And there were, of course, the nearly three dozen bridges over the Albert Canal (*ENR* June 28, 1945, vol. p. 886), which were blown up in 1940, and rebuilt only to be destroyed again in 1944, that have provided other examples of reconstruction. By the time all of Belgium's bridges are restored, probably three or four decades of normal bridge building will have been carried out in a period of a few years.

Tunneled Sewer Avoids Traffic Snarls

***Contents in Brief*—Hand-tunneled construction of a shallow 4-ft. dia. sewer avoided interference with heavy traffic near the Hartford, Conn., railroad station. Reinforced concrete pipe encased in concrete inside pressed steel tunnel liner plates helped to speed the installation.**

IT IS UNUSUAL to install a 4-ft. diameter sewer at the shallow depth of 20 ft. by tunneling methods. But this was specified for part of a project in Hartford, Conn., to avoid blocking a street near the railroad station and for passage under a low 4-track mainline railroad viaduct. It was also found expedient by the contractor to use the same method for the remainder of the job.

The new sewer is part of the changes necessitated by construction of the Park River flood control conduit through the city (*ENR* Jan. 29, 1942, vol. p. 183). It takes sanitary sewer flow from the new Gully Brook conduit by means of an automatic float-operated regulator gate and conveys it to the Park River interceptor for transmission to the city's sewage treatment plant. In addition, it serves other connections disturbed by the flood control construction and its incidental changes.

Heavy traffic in narrow street

Several factors pointed to the advisability of tunneling for at least a portion of the sewer's 1,000-ft. length. First, the line crossed Asylum St., a main thoroughfare leading west from the heart of the city. It then runs through Union Place, where heavy taxi and bus traffic serving the railroad station already overtaxed the street's capacity. In some places the width of this street between curbs is as little as 32 ft. Furthermore, there are many pipes and ducts near the street surface and tunneling beneath them left them undisturbed. Open-cut through this area would have meant closing the entire street to tarffic. Manhole excavations were used as tunnel shafts, but this required closing only a portion of the roadway.

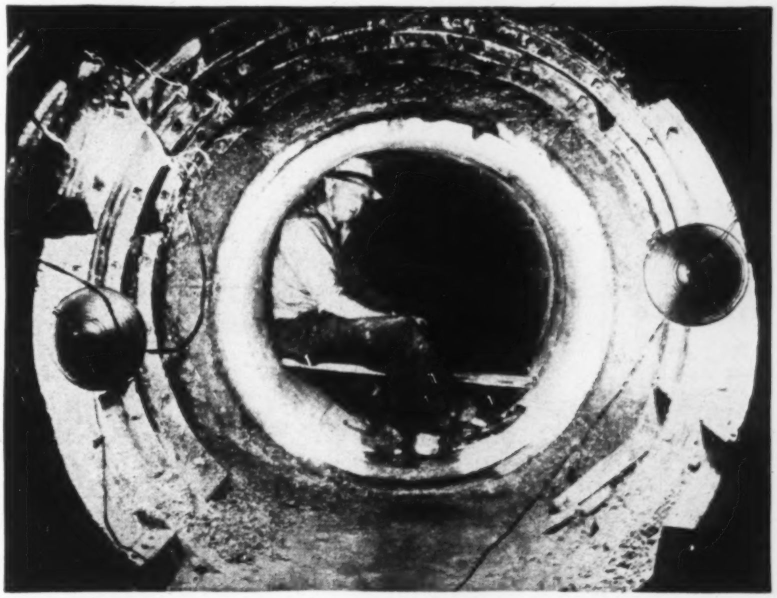
In the last 150 ft., where the inside diameter is reduced to 42 in., the sewer passes between two rows of steel columns 19 ft. apart. These columns support the heavy 4-track mainline viaduct. Here, it was felt, tunneling would permit less ground movement than would open-cut construction. And the additional cost of the tunneling was largely offset by the fact that open-cut construction under the viaduct had to be by hand, as lateral and vertical clearance precluded machine excavation.

These circumstances resulted in tunnel construction being specified for a 308-ft. section in the narrow portion of Union Place and for a 100-ft. section under the railroad viaduct. Either tunnel or open cut was allowed throughout the remainder of the job. However, for the reasons already given and because of the added expense and difficulty of cutting and replacing the heavy paving in Union Place (8-in. granite blocks on a 6-in. concrete base), the contractor chose to do the entire job by tunneling except for two short lengths of open cut.

Tunnel excavation was entirely by hand, using pneumatic-powered clay spades. Spoil was removed in wheelbarrows to the shafts, where a crane lifted it to the surface by clamshell bucket or dump box. In general, the material excavated was a moist varved clay, although some silt and soft miscellaneous material was encountered in traversing an old creek bed. Excavated materials were trucked to fill areas in a nearby park.

As soon as a heading had been advanced 16 in., pressed-steel tunnel liner plates, shaped to the 72-in. or 66-in. dia. required for the 48-in. and 42-in. sections of the sewer, respectively, were bolted in place. Segments of these 16-in. liner rings were $37\frac{11}{16}$ in. long by $\frac{3}{16}$ in. thick. With an average of four men to a heading, progress at each was about $7\frac{1}{2}$ ft. for a 10-hr. day. When a heading had been advanced about 30 ft. any voids outside the liner plates were filled by low-pressure grouting.

Drainage presented no special problem. What little water was en-



Concrete encasement of reinforced concrete pipe inside bolted steel liner plates completed hand-tunnelled 48-in. dia. sewer under heavily-traveled city street.

countered was pumped from the shaft bottoms as required. In one location, however, 2-in. iron pipe was used to carry away drainage under the concrete pipe while it was being laid and encased in concrete.

In the 48-in. dia. section comprising the first 860 ft. of the sewer, reinforced concrete pipe was used throughout. The 4-ft. lengths were cast with slip joints for the tunnel section; lock joints were used in the open cut. For the 42-in. dia. section, monolithic concrete pipe was formed in place inside the tunnel lining under the railroad viaduct, but reinforced concrete pipe encased in concrete to 10 in. above the springline was used in open cut.

Inside the tunnel liners a concrete invert was placed to the 0.12 percent grade of the pipe bottom. Pipe was then set to line on this base and the annular space between pipe and liners was filled with concrete. Future house connections were provided by casting tile stubs in the concrete lining to correspond with 8-in. openings cast in the pipe. Pressure grouting was used to fill any voids left between the concrete and the liner plates.

The work was done under the direction of Robert J. Ross, manager of the Metropolitan District's Bureau of Public Works. For the bureau Willard S. Brewer, deputy manager, was in charge of this project; Judson B. Root was chief inspector; and Arthur B. Sweeton, III, was designing engineer. Contractor for the job was F. B. O'Neil & Co., of Hartford, for whom Francis O'Neil was in charge.

British Test Bomb Damage In Destroying Heligoland Structure

The famous fortress island of Heligoland off the northeast coast of Germany, often referred to as the "Gibraltar of the North Sea," recently was subjected to 10-ton earthquake bombs and special penetration bombs by the Royal Air Force. The project was carried on to determine the destructive effect on the underground tunnels and the heavily reinforced concrete structures and submarine pens that project above the ground. In addition to the experiments on destructive effects, it is hoped that the bombing may result in some displacement of the underground strata and thus simplify the demolition of the extensive tunnel system, built by the Germans, according to an article in *The Engineer* (London) for April 19.

When the British took over the island after the war it was found to be underlaid by eight miles of tunnels in a labyrinthine layout. The town site and all of the structures above ground except a central control tower were completely demolished by bombing.

Holes cut through the reinforced-concrete roof, 14 to 20 ft. thick, over submarine pens at Farge, Germany, by "Grand Slam" bombs weighing 22,000 lb.

The main part of Heligoland is a wedge-shaped mass of red sandstone, seamed with streaks of gray clay standing sheer out of the North Sea to a height of about 250 ft. This rock has a virtually flat top. At the southeastern end of the island is a reclaimed area in which a mole-protected harbor has been established, and where some submarine pens had been built. Although these pens were hit by no less than 23 bombs, none of them penetrated the concrete roofs.

All of the gun batteries on the islands were controlled from a tower 30 ft. square at the base and about 80 ft. high. Faced with red brick of the same color as practically everything on the island, the tower was found to be constructed of reinforced concrete 3 ft. thick and internally subdivided by other thick reinforced concrete walls. It connected with the tunnels.

Despite the extensive bombing to which Heligoland was subjected, records indicate that only 23 persons were killed, all but three of whom were members of anti-aircraft gun crews. The reason for this small loss of life was that the civilian population of about 3,000 persons practically lived in an underground system known as the "spirali". Built within a section of the south cliff, the "spirali" was a double spiral tunnel leading from the reclaimed land up to the plateau. The spirals were not circular but oval in plan. Off the spiral tunnels there were small tunnels leading into compartments forming additional air raid shelters. This spiral tunnel offered the only way for small wheeled traffic to reach the plateau.

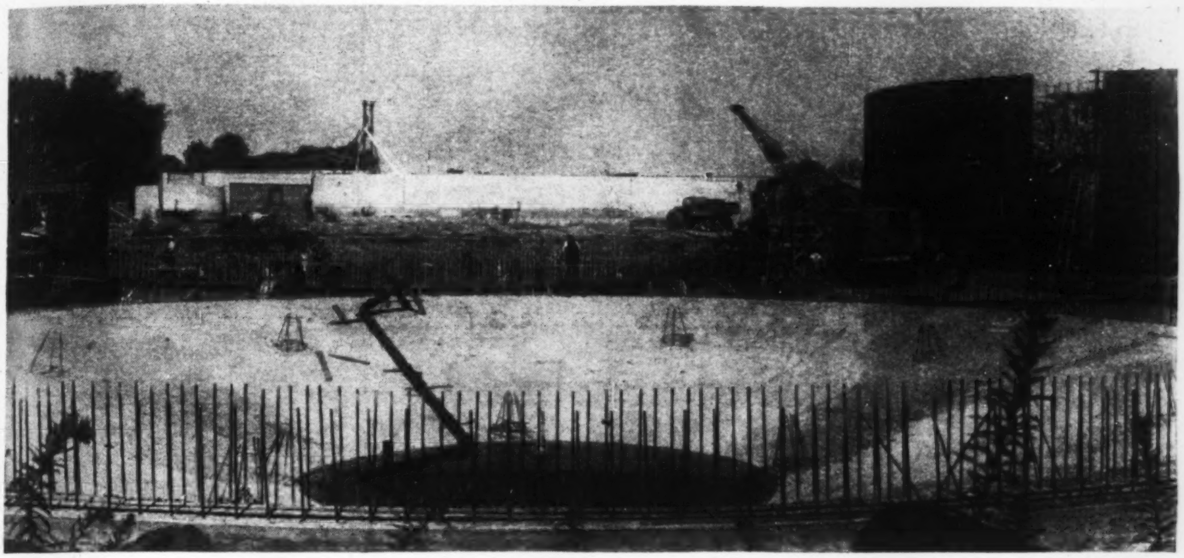


Fig. 1. New Toronto sewage plant takes shape despite shortages of labor and materials since construction began.

Toronto Fights a Disposal Battle

Contents in Brief—*Sewage disposal at Toronto is complicated by the fact that effluent from the present overloaded plant goes into Lake Ontario between the water-supply intakes. Construction of a new plant to eliminate this pollution hazard was begun before the war, but had to be stopped. Now work is being pushed on a plant that will give a high degree of purification for a population of 700,000.*

LIKE most Great Lake cities, Toronto has the dual problem of disposing of its sewage while reducing pollution of its own and other water supplies drawn from the lake. The problem here is complicated, however, by factors not generally found elsewhere. Not only is the present sewage treatment plant, which affords only primary treatment, seriously overloaded, but effluent from this plant is discharged into Lake Ontario about midway between the intakes of the city's two major water systems. Thus at least a portion of the water supply is subject to contamination no matter what the direction of the lake's littoral drift.

The present situation was foreseen several years ago. Steps to meet it were taken as early as 1933, when the consulting engineers made the first report on a new complete-treatment plant to be located outside the city proper. This involved a long, expensive transmission main to the plant, which was designed for a population of 870,000. Cost of the activated sludge project was originally estimated at $20,000,000.

Since then, a closer site on a broad neck of land between Ashbridge Bay and Lake Ontario has been selected for the new treatment plant. Also, the design population has been reduced to 700,000 and certain details have been changed. Revised cost estimates (prewar basis) have run as low as $9,500,000.

Project divided into three phases

The whole project, including complete treatment by the activated-sludge process, is divided into three parts. The first of these includes a sea wall, primary sedimentation tanks, four digestion tanks, control installations and part of the outfall conduit. This portion is already under construction on a cost-plus-fee basis. A ceiling price of $1,791,697 is stipulated, however, in the contract.

The second step of construction is planned to provide for chlorination; grit removal; elutriation, mechanical dewatering and incineration of sludge; and construction of the remainder of the outfall line. Also included are: extension of the existing pumping station, a conduit connecting the pumping station to the new plant, sludge-gas storage and utilization facilities, and administration buildings.

Effect of primary treatment

This work, which will complete the first stage of the plant so that it can be used for primary treatment, was estimated before the war to cost $4,400,000. Operation as a primary treatment plant is expected to reduce suspended solids in the effluent to 130 ppm. or less, and the biochemical oxygen demand to 175 ppm. or less.

Step three in the plant's construction will provide a blower building, aeration tanks, final clarifiers, four additional digestors, added control

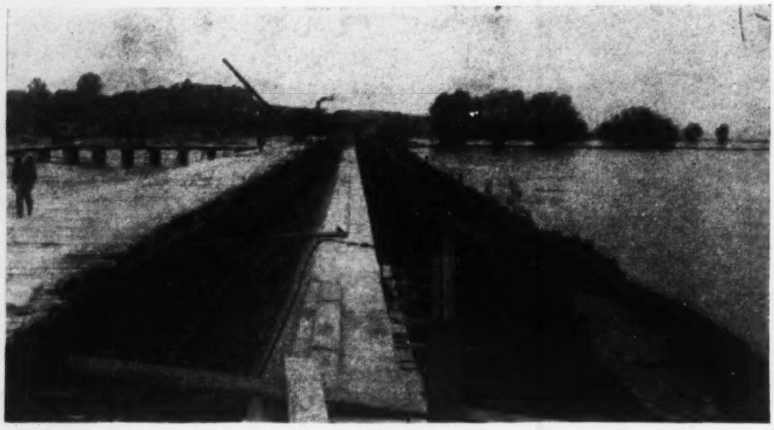


Fig. 2. The sea wall required by lakeshore erosion was the first structure built. Piling of the construction trestle at left was later pulled and redriven in the foundations of permanent plant structures.

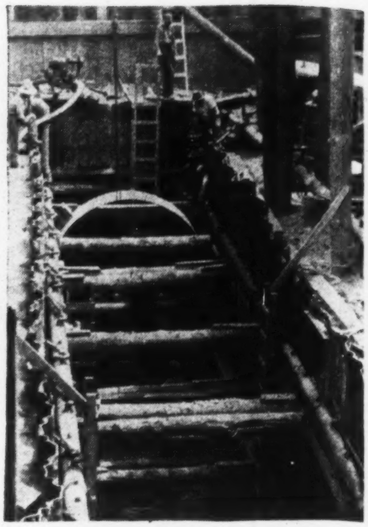


Fig. 3. Excavations below lake level, like this trench for the outfall conduit beneath the sea wall, were kept dry by well-point systems.

Facts and Figures on New Toronto Sewage Plant

Area Served: 20,000 acres in city of Toronto, Canada.

Design Population: 700,000

Capacity: Dry-weather flow, 84 mgd. (imperial gallons — about 101 mgd. U. S.). Storm flow through grit chambers, course screens and primary settling tanks, 210 mgd. (about 252 mgd. U. S.); through aeration and final sedimentation tanks, 126 mgd. (about 151 mgd. U. S.)

Treatment: Activated sludge in final phase; present construction for primary treatment only. Sludge digestion, elutriation, mechanical dewatering and incineration; coarse screenings ground and passed through plant; effluent chlorinated and discharged to Lake Ontario.

Outfall: 3,300 ft. of reinforced concrete pipe 9-ft. dia. inside.

Existing Structures: Pumping station, sedimentation tanks and sludge beds. Pumping station to be utilized in new plant, remainder abandoned.

Structures in Present Contracts: Six primary clarifier tanks, 4 digestion tanks, sea wall along lake front, drop shaft and outfall conduit.

Structures to Complete Primary Treatment: Pumping station extension; transmission main; chlorination facilities; grit chambers; and sludge elutriation, dewatering and incineration facilities.

Additional Structures for Complete Treatment: Aeration tanks; blower installation; 4 digestion tanks; final clarifiers; and sludge-gas storage and utilization installations.

Designers: Gore and Storrie, of Toronto, and Metcalf & Eddy, of Boston, Mass.

Contractors: Rayner Construction Ltd., of Leaside, Ont. (first phase), and Foundation Co. of Ontario Ltd. (Lake outfall).

Cost: $9,500,000 (prewar est.)

facilities and extension of the sea wall. At a prewar estimate of $3,900,000, this will complete the final stage of the plant. Suspended solids and BOD in the effluent are then expected to be between 14 and 22 ppm. each, with resulting increase in chlorination efficiency.

Progress slow but fairly steady

War-induced increases in domestic and industrial waste loads on the old treatment plant forced a start on construction of the new one in September, 1943. Work on the first step of construction has been going on since, and despite serious material and labor shortages, progress is being made.

The section of sea wall needed to protect structures in the first contract is already finished. In fact, severe storms during a period of abnormally high lake level in the summer of 1943 had so badly eroded the shoreline at the plant site that the wall (Fig. 2) and the fill behind it were needed before work on the other installations could begin.

Also completed is the drop shaft to the outfall and a section of the outfall under the sea wall. The primary sedimentation tanks are fairly well completed and work is progressing on the first group of four digesters. Fig. 1 is a general view of the site showing the status of these operations in August of this year

Each of the six covered, reinforced

concrete sedimentation basins measures 66½x200 ft. inside; average depth is 16.7 ft. Concrete for these tanks was placed by pavers operating from temporary trestles between each pair of basins, the floor concrete being chuted into place. Wall forms were faced with a hard-surfaced material to give dense uniform concrete surfaces.

Long and heavy outfall sections

In addition, a contract was recently awarded for construction of the remainder of the 3,300-ft. outfall leading to deep water in the lake. This reinforced concrete pipe, which is 9-ft. dia. inside, is being cast on shore in 100-ft. lengths, each weighing 220 tons. These sections will be placed in position on the lake bottom by a 300-ton derrick barge, which was specially built for placing the corresponding reinforced concrete intake conduits for the city's new duplicate water supply system.

Bids recently were asked for the four 56-mgd. pumps (imperial gallons—about 67 mgd. U. S.) to provide low-lift service.

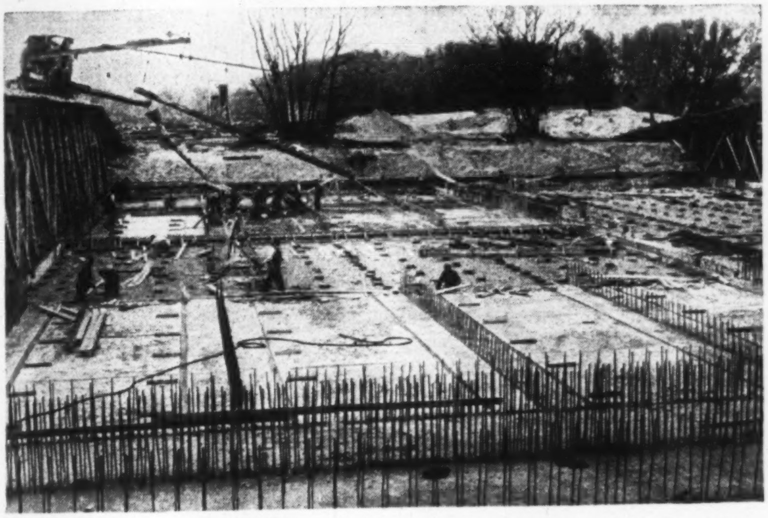


Fig. 4. Construction of the six primary settling tanks was facilitated by temporary trestles between each pair of basins.

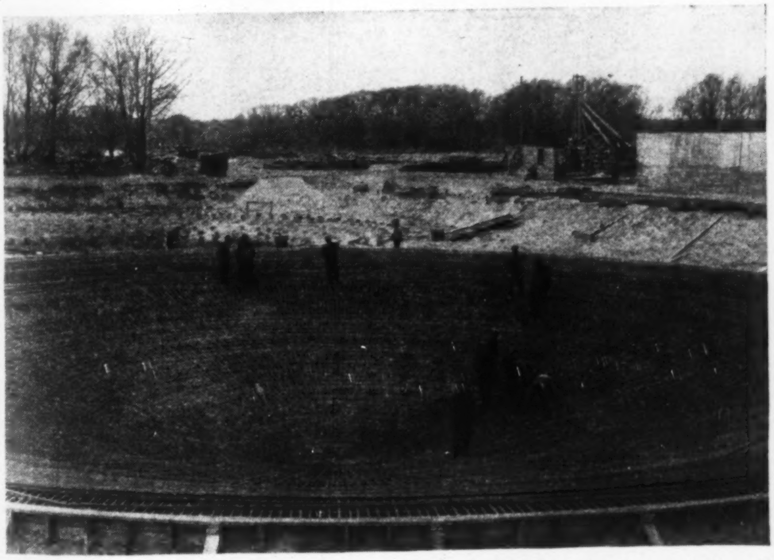


Fig. 5. Bad foundation conditions of the site are reflected in the heavy steel mats of the cone-shaped digester bottoms and in the 9,000 piles required for major structures of the plant.

Consulting engineers on the project are Gore and Storrie, of Toronto, and Metcalf & Eddy, of Boston, Mass. For the city, G. G. Powell is commissioner of works and G. Phelps is chief engineer for sewers.

Construction contractors

Contractor for the first section of the work is Rayner Construction Ltd., of Leaside, Ontario, for whom G. Waring, G. I. Price and G. Hogarth are general superintendent, superintendent and engineer, respectively. The contract for construction of the outfall conduit is held by The Foundation Company of Ontario Ltd.

Sanitary Landfills Cut Waste Disposal Costs

Garbage disposal by the sanitary landfill method costs the city of Fort Worth, Tex., about one-third as much as does disposal by incineration. Because of this economy, shown by 15 months of experience with parallel operation of both methods, the city has closed two of its four incinerators.

Detailed figures on the two methods show a cost of $0.38 per ton for the sanitary landfill method as compared to $1.12 for incineration. Unit costs per cubic yard are $5.37 and $15.96, respectively. Included in the incineration cost figures are: labor; supervision; supplies; building and furnace maintenance; ash and refuse removal; and building and plant depreciation. Cost figures on sanitary fill operation include labor; supervision; supplies; and repairs, maintenance and depreciation of equipment.

Lower unit costs for the landfill operation are ascribed in part to an increase in production per truck. This increased efficiency is brought about by shorter hauls to landfill sites close to population concentrations and by elimination of the unloading delay at incinerators.

Among other cities recently adopting the sanitary landfill method of refuse disposal are Pensacola, Fla.; Tulsa, Okla., and Columbus, Ga. Columbus is abandoning its incinerator, operated at a cost of $1 per ton, in favor of landfill disposal after finding that it costs a suburban area $0.40 per ton for this service.

Variable Flow in Level Channels Solved by Simple Chart

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and Consulting Engineer, respectively, Austin, Tex.

***Contents in Brief**—Surface profile computations for varied rates of flow in rectangular channels having level bottoms are simplified by using the chart shown. Examples are given to illustrate use of the curves.*

ENGINEERS are often faced with the tedious problem of determining the drop-down curve or surface profile for various rates of flow in rectangular channels having level bottoms. In a sewage treatment plant, for example, it may be important to know the depth and velocity of the liquid flowing in such a channel connecting two tanks whose water surfaces are controlled by effluent weirs.

If the connecting channel be incorrectly designed, the water depth at the upstream end of the channel may submerge the effluent weir of the first tank and cause serious short circuiting in that tank. On the other hand, if the channel be too large, velocities may be reduced to the point where objectionable settling will occur. In fact, this problem involves the study of many different combinations of width, depth and length of channel to carry the varied rates of flow which can be expected daily, monthly and yearly during the economic life of the plant.

Chart for non-uniform flow

The authors have been unable to find published any simple and rapid solution of this problem, since it involves non-uniform flow and cannot be solved by the many available charts for uniform flow. Therefore, a simple type of chart for solving this problem rapidly and with sufficient accuracy to meet most practical needs is presented. In the preparation of this chart, use has been made of the works listed in the accompanying bibliography.

In developing a series of curves (Fig. 1) for rectangular channels of 6, 9, 12 and 24-in. width, and having level bottoms, the surface profiles for a number of different flows in each channel were first computed. One of these profiles is shown in Fig. 2. The starting point was taken at the downstream end of the channel where the depth of flow is the minimum or critical depth d_c for

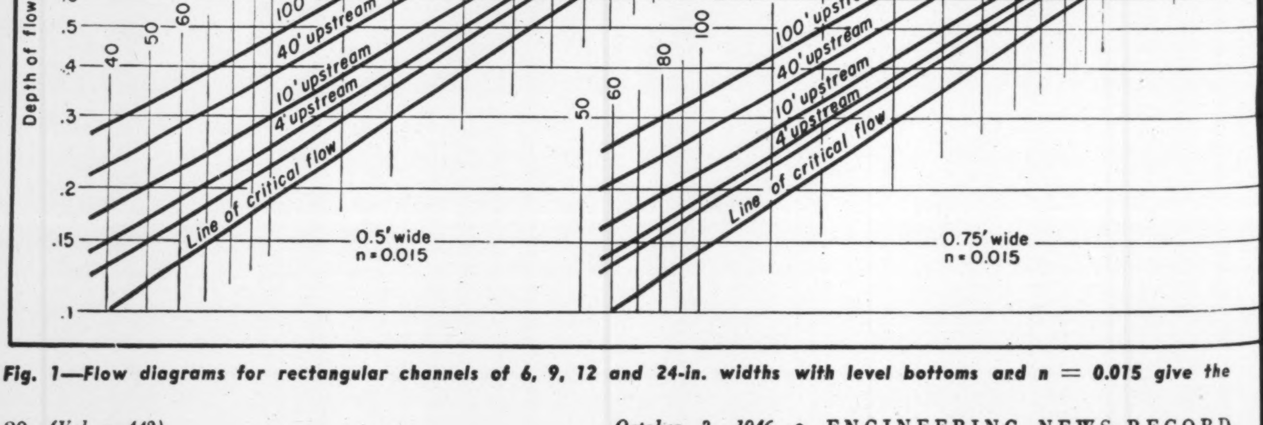


Fig. 1—Flow diagrams for rectangular channels of 6, 9, 12 and 24-in. widths with level bottoms and n = 0.015 give the

the rate of discharge (except in the case of free fall). Under these conditions,

$$d_c = 0.314 \left(\frac{Q}{b}\right)^{2/3} \qquad (1)$$

where Q is the flow in cfs. and b is the width of the channel in feet. The computations were based on the slope of the energy grade line, rather than on the slope of the water surface, since the former is not as steep as, and is more nearly uniform than the corresponding slope of the water surface.

The water surface profile shown in Fig. 2 was developed for a rectangular channel 9 in. wide, with level bottom and carrying 1,915 gpm. Manning's formula with a value of $n = 0.015$ was used in computing the loss of energy head. The curve shows that the water depth increases from a value of 1.00 ft. at the section of critical depth to 1.98 ft. at a distance 100 ft. upstream. For any intermediate depth, the curve will show how far that depth occurs upstream from the point of critcial flow. In constructing this surface profile, the Manning formula was used, with the length of reach for successive increments of depth computed by Husted's method.

The Manning formula then may be transposed and written as follows:

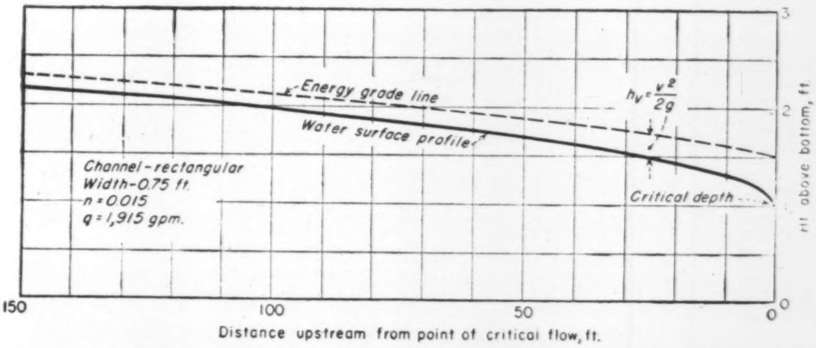


Fig. 2. Typical flow profile for rectangular channel with level bottom. Adjustment for other values of n is simple slide rule calculation.

$$S_e = \frac{(d_1 + hv_1) - (d_2 + hv_2)}{L} = v^2n^2/2.21\, r^{4/3}$$

where S_e is the slope of the energy grade line, and r and v are respectively the hydraulic radius and velocity for the section of mean depth between d_1 and d_2. Thus, the distance L, and ΣL, between any two sections is seen to vary inversely as n^2. Therefore, these curves can be used for other values of n by changing the distance L in the ratio $(0.015/n)^2$.

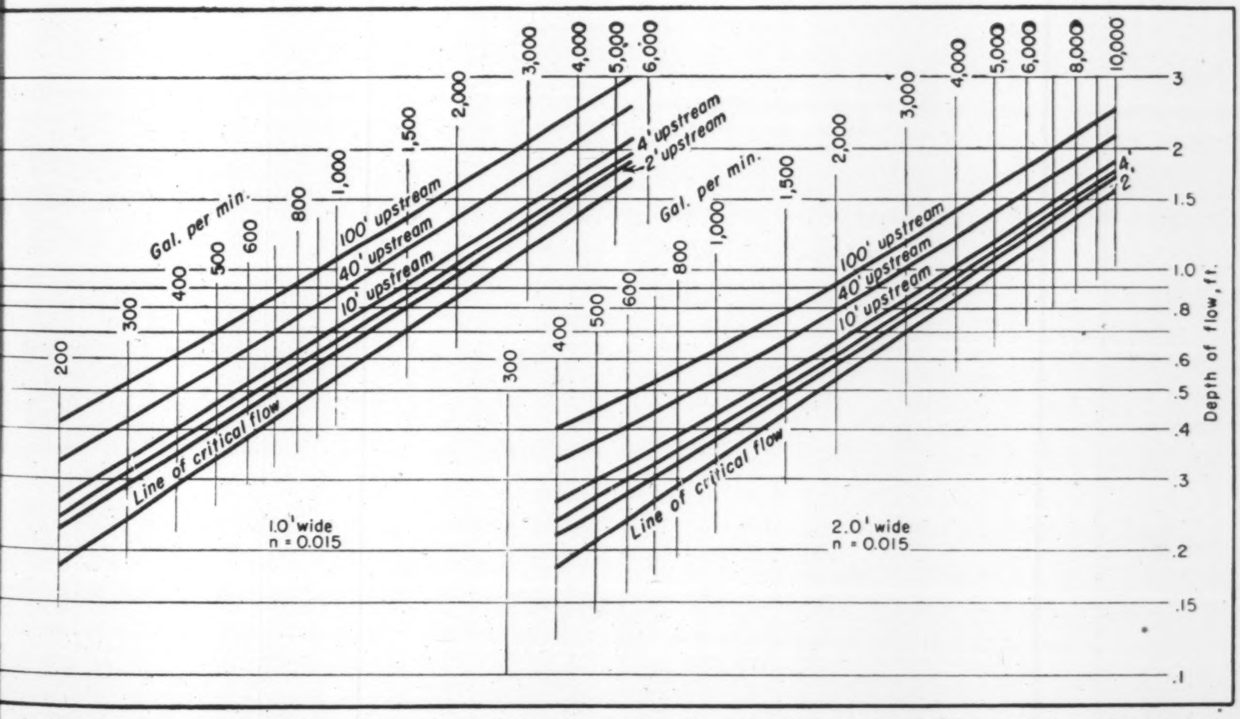
Three numerical examples will serve to illustrate the use of the curves in Fig. 1.

Example No. 1—Given a rectangular channel 12 in. wide and 15 ft. long, with level bottom, and discharging 1,750 gpm. into a tank having a water surface which is 0.78 ft. above the channel bottom ($d_2 = d_c$). Find the depth of water at the upstream end (a) when $n = 0.015$; (b) when $n = 0.012$.

Solution (a) Fig. 1 shows, for a channel 12 in. wide and carrying 1,750 gpm., a minimum depth of 0.78 ft. at the discharge end, and a depth d_1 of 1.1 ft. at a distance of 15 ft. upstream.

(b) The loss of energy head for a distance of 15 ft. when $n = 0.012$ will be the same as for a distance of 9.6 ft. when $n = 0.015$. This will be seen from the formula above, for

Distance $= L(n/0.015)^2 = 15(0.012/0.015)^2 = 9.6$ ft. From the curve, the



depths of water at the critical points and selected upstream locations for the ranges of flow usual in such structures.

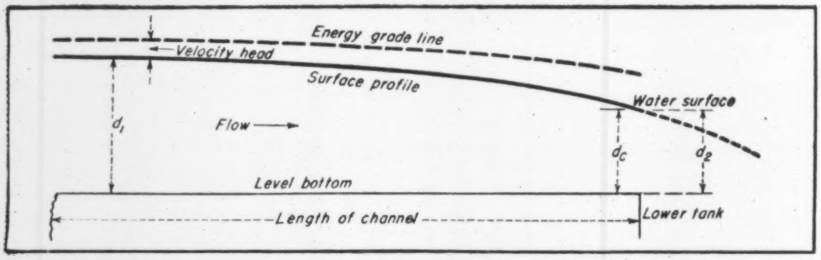


Fig. 3. General case of flow profile shows relation of water surface in lower tank to other elements of flow in level-bottom channel.

depth at 9.6 ft. upstream is found to be 1.0 ft., which, then, is the depth at 15 ft. upstream when $n = 0.012$.

Example No. 2—Same as Example No. 1, except that the water surface in the lower tank is 0.90 ft. above the channel bottom ($d_2 > d_c$).

Solution (a) The depth of water at the downstream end of the channel is determined by the water surface in the tank. From Fig. 1, for a flow of 1,750 gpm. the depth of 0.90 ft. is seen to be 2 ft. upstream from the end of the channel, therefore, the desired depth will be found on the curves at a distance of 2 + 15 = 17 ft. upstream from the point of critical flow. The depth is seen to be a little more than 1.1 ft.

(b) The loss of energy for a distance of 15 ft. when $n = 0.012$ was shown above to be equal to that for 9.6 ft. when $n = 0.015$. The desired depth will then be found on the chart at a point 2 + 9.6 = 11.6 ft. upstream from the point of critical flow. From the chart, this is seen to be 1.04 ft.

Example No. 3—Same as Example No. 1, except that the water surface in the lower tank is less than 0.78 ft. above the bottom of the channel ($d_2 < d_c$).

Solution (a) As d_2 changes from the critical depth d_c to zero, the point of critical flow moves upstream. When d_2 has become zero or negative (water surface in the tank below the bottom of the channel) we have a free overfall, and the point of critical flow is from $4d_c$ to $11.6d_c$ upstream from the end of the channel. It may be that frictional differences in the channels used by different experimenters have caused this variation. With $n = 0.015$, and d_2 zero or negative, the point of critical flow would be from 4(0.78) = 3.1 ft. to 11.6(0.78) = 9.0 ft. upstream from the end of the channel, and the upstream end of the channel would be from 11.9 to 6.0 ft. upstream from the point of critical flow. The curves show a depth of from 1.02 to 0.98 ft. at these distances.

(b) Reducing the distances of 11.9 and 6.0 ft. above in the ratio $(0.012/0.015)^2$, we have 7.6 and 3.8 ft., respectively, as the distances upstream from the point of critical flow. From Fig. 1, the depths are 0.98 and 0.95 ft. for $n = 0.012$. It will be noted that this variation in the distance upstream does not produce a serious difference in the depths obtained, but to be on the safe side, the greater depth should be used. Should d_2 lie between d_c and zero, the point of critical flow will lie between the end of the channel and a point $4d_c$ to $11.6 d_c$ upstream.

Should the conditions at the upstream end of the channel be such as to involve entry and velocity head losses, these losses should be added to the depths obtained from the curves to obtain water levels in the upper tank.

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German Water and Waste Treatment Practices Described in New Reports

German water supply practices and methods for disposal of sewage and industrial waste are described in a report now on sale by the Office of Technical Services, Department of Commerce. The report was made by investigators for the department's Technical Industrial Intelligence Division.

In general, German practices have developed along conventional lines, the investigators say. More than 75 percent of German public water supplies come from underground sources.

Chlorination receives less attention in Germany than in the United States, according to the report. Ground waters are of good quality and do not require much chlorine. Usually 0.1 to 0.2 ppm. of chlorine are applied to the water entering filtered water reservoirs. At Stuttgart, however, super-chlorination (5.0 to 9.0 ppm.) is used, followed by dechlorination through granular activated carbon filters. Except at Stuttgart, the largest amount of chlorine used is 0.6 ppm. in the Tegal plant in Berlin.

The quality of water delivered to German consumers after filtration is excellent, even without chlorination. Water supplies vary in degrees of hardness from 10 to 500 ppm., the average running from 100 to 200 ppm. Hardness is largely of the temporary or carbonate type. Technical control is good, and health officials are alert in checking the distribution systems.

German sewage disposal plants also are similar to those in the United States (see *ENR* Jan. 24, 1946, vol. p. 140). A few of the items of special interest noted by the investigators were the use of enclosed trickling filters to reduce fly and odor nuisances, extensive use of pneumatic ejectors for raw sludge pumping, the absence of contact filters, and the generation of gas from farm wastes. German methods for treating cyanide, chromate, copper, and phenolic industrial wastes were considered of interest, although no major items of new equipment were noted.

Besides this report, designated as PB-3549, three others on German water supply practices are also available from OTS. PB-3573 is an original German report, prepared by the Geiger factory at Karlsruhe, giving a comprehensive picture of recent developments in German water purification techniques; PB-3579 contains drawings of various German industrial water and filtration plants; PB-3550 is a reprint from the *Handbuch der Lebensmittelchemie*, published in 1940, containing a condensed study of chemical analysis methods for water.

Orders for the reports should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C.

Design of Explosion Pressure Vents

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Contents in Brief*—In some cases, explosion damage to buildings and equipment can be prevented by installation of vents to relieve the pressure before it builds up to the danger point. The required area of vent may be calculated if the rate of pressure rise is known. While the most effective vent is an unobstructed opening, closures must be provided for a number of reasons, and any one of several devices may be adopted for this purpose.*

ENGINEERS AT INDUSTRIAL plants where explosion hazards exist have found that in certain instances buildings and equipment can be protected by installing vents through which pressure can be released before it becomes sufficiently high to cause structural damage. Many factors are involved in the design of venting devices, and the peculiar behavior of some explosive dust or gas and air mixtures complicates the problem.

Venting for an explosion pressure is quite different from the release of excess pressure through a device such as a steam-boiler safety valve. In the latter case the pressure rise is comparatively slow, and the valve can be set within fairly close limits to open and close at certain predetermined pressures. Explosion vents to be effective must release pressures that may rise at a rate of thousands of pounds per square inch per second, and equilibrium with the outside atmosphere must be obtained quickly enough to prevent the pressure on enclosure walls from exceeding that which they were designed to withstand.

Probably the first attempt to provide protection against explosion damage by venting the pressure should be called the "sacrifice method." Light roofs, weak walls, loose skylights, and similar types of construction were incorporated in buildings where explosion hazards existed, and whenever an explosion occurred, these components would be blown away, or sacrificed, to save the more substantial portions of the structure.

In many cases, such measures were effective, or at least the cost of repairs was much less than the amount that would have been required to rebuild the entire plant. Interruption of manufacturing operations while repairs were being made, however, added greatly to the cost of such protection. Moreover, there was always the added danger of someone being injured or killed by flying portions of the walls or roofs that served as vents. Safety engineers were soon searching for a better and safer method of releasing explosion pressure.

Since about 1925, attention has been given to the scientific application of vents for the release of pressure produced in explosions. Significant results are reported in the U. S. Bureau of Mines and the Safety in Mines Research Board of England paper, "Coal Dust Explosions: The Effect of Release of Pressure on their Development," by H. P. Greenwald and R. V. Wheeler; U. S. Bureau of Mines Technical Paper 553, "Protection of Equipment containing Explosive Acetone-Air Mixtures by the use of Diaphragms," by G. W. Jones, E. S. Harris, B. H. Beattie; and the paper, "Venting Dust Explosions," by Hylton R. Brown and Richard L. Hanson, National Fire Protection Association *Quarterly*, vol. 26, no. 4, pp. 328-341, April, 1933.

Breaking of glass critical

Early attempts to determine the venting area required to provide protection against explosion pressure were based on data obtained during dust explosions produced especially for this purpose in rooms, buildings and galleries. Measurements were made to determine the pressure that

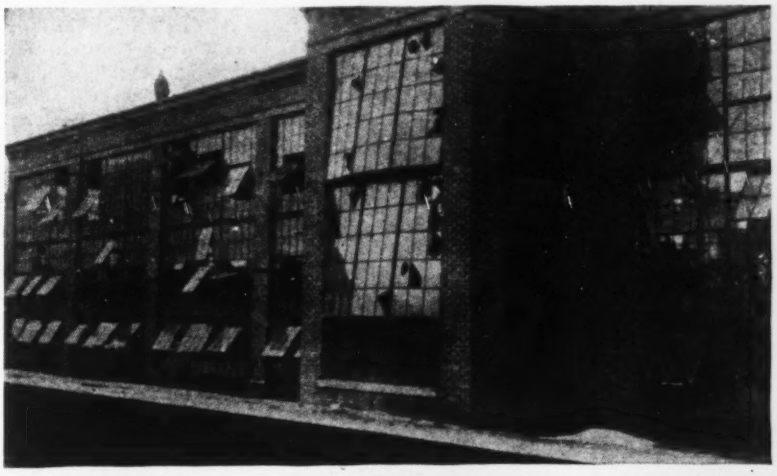


Fig. 1. Hinged windows vented explosion pressure, preventing serious damage, whereas the fixed sash in the tower were torn from their anchorages.

explosions exerted on walls, and the force required to open doors, windows, shutters and other venting devices. For example, the breaking strength of a pane of glass of the size and type frequently used in industrial plants was found to be about 300 psf., and this figure was arbitrarily adopted as the point at which structural damage would occur.

Repeated experiments showed that the area of the openings required to prevent explosion pressure on the walls of a small room from exceeding 300 psf. was different for nearly every dust tested. It also varied considerably when the same dust was ignited under different conditions.

Attempts to determine the type and amount of venting required for explosion protection have usually been based on the relative inflammability or explosibility of the substance producing the hazard. In addition, classifications of the relative explosibility of different dusts are usually based entirely on the results of laboratory tests designed to indicate the maximum pressure developed when a given weight of dust is thrown into suspension and ignited in a closed bomb. On this basis, the recommended ratio of venting area to volume to be vented ranged from 1 sq. ft. per 100 cu. ft. for some grain dusts to 1 sq. ft. per 15 cu. ft. for certain metal powders and explosive gases.

Although maximum pressure determinations are important, it is also necessary, before the explosion hazard of dusts, vapors and gases can be properly evaluated, to determine the ease of ignition, the optimum concentration (assumed to be the point at which all dust in suspension will use all the available oxygen and at which the maximum pressure or rate of pressure rise will occur) and especially the rate of pressure rise.

Tests and demonstrations have also shown that the rate of pressure rise in an enclosure equipped with a vent is not the same as the rate determined in the closed bombs generally used in laboratory experiments. Evidently, then, in calculating venting requirements, the rates of pressure rise that are applicable to vented enclosures must be used instead of the maximum or average rate of pressure rise usually reported in laboratory tests.

Such information is extremely limited, but the rate can be determined approximately by drawing a tangent to a time-pressure curve obtained in laboratory tests (Fig. 2). These curves are produced by photographic or stylographic recordings of the rise in pressure on film or paper mounted on a revolving drum and containing the necessary calibrations to show the time interval in which the pressure rise occurs.

Calculation of vent area

Before any calculations of venting requirements can be made on the basis of the rate of pressure rise, it is necessary to know (1) the volume of the space to be vented; (2) the pressure that the walls of the enclosure can withstand; (3) the maximum pressure produced in explosions of the dust or gas and air mixtures; and (4) the rate of pressure rise in such explosions obtained as previously described from time-pressure curves.

Explanation of the method that has been worked out for the calculation of required venting area may be clarified by reference to Fig. 2, which shows a time-pressure curve obtained in a laboratory explosibility test with a sample of cornstarch. It is assumed that a cubical bin with a volume of 1,000 cu. ft. is filled with an explosive mixture of such starch and air. Also, the walls of the bin are assumed to be able to withstand 2 psi., or 288 psf., which is only slightly less than the 300 psf. arbitrarily selected in the early experimental work previously mentioned. It will be noted that a maximum pressure of 47 psi. (*dh*, Fig. 2) was obtained in this test, and the maximum rate of pressure rise (*fg*/*ef*) exceeds 1,000 psi. per sec.

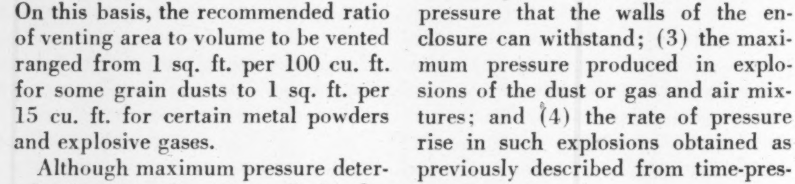


Fig. 2. Time-pressure curve for cornstarch, based on laboratory explosibility tests, is used to determine pressure rise for vent area calculations.

A tangent has been drawn at the point on the curve representing 2 psi. This line indicates that the rate of pressure rise when 2 psi. is the maximum permissible pressure will be about 190 psi. per sec. The time required under such conditions to reach the maximum pressure, 47 psi., will be about 0.25 sec.

The absolute pressure generated by an explosion of this particular type of starch will be 47 psi. plus atmospheric pressure (14.7 psi.), or 61.7 psi., and the volume of the products of combustion reduced to atmospheric pressure will be:

$$\frac{61.7}{14.7} \times 1{,}000 = 4{,}200 \text{ cu. ft. (approx.)}$$

The volume of gas to be vented will be 4,200 cu. ft. less the 1,000-cu. ft. volume of the bin, or 3,200 cu. ft.

If 0.25 sec. is required to reach the maximum pressure and the volume of the products of combustion to be vented in that time is 3,200 cu. ft., the rate of generation of the gas to be vented will be 3,200/0.25 = 12,800 cu. ft. per sec., or 768,000 cu. ft. per min.

At this point in the sample calculation, another assumption is necessary. There will be some velocity pressure loss as the products of combustion enter and flow through the vent. If the vent is not a free opening or if the gases flow through ducts in which there are elbows, turns or obstructions, further losses will occur. Each installation will present different conditions for consideration.

In this example it is assumed that the vent opens to the atmosphere without any long ducts or major obstructions and that a factor of 0.4 represents the loss. Then 1.4 times the velocity pressure must equal the total permissible pressure, which in this instance has been set at 2 psi. The velocity pressure under such conditions will be equal to 2/1.4 or 1.43 psi. or 39.62 in. of water.

The velocity obtained by substitution in the formula $4{,}005\sqrt{P}$ will be:

$$4{,}005\sqrt{39.62} = 25{,}230 \text{ ft. per min.}$$

The size of the vent required to provide protection under the assumed conditions will be $768{,}000/25{,}230 = 30.4$ sq. ft.

Attention is called to the fact that calculations of venting requirements as described above are for cubical or approximately cubical enclosures. Such calculations may not accurately indicate the venting areas required to protect long narrow enclosures, such as galleries and tunnels, or slender equipment, such as ducts and elevator legs. Reliable data on which to base calculations for such enclosures and equipment must await further experiments and large-scale tests. In the meantime, it is recommended that odd-shaped enclosures be theoretically divided into approximately cubical sections and venting requirements determined for each unit.

Unusually large ratios of vent area to volume may be necessary to release explosion pressure before it exceeds the comparatively low resistance of walls built to withstand only ordinary wind pressure. In some cases, provision of sufficient venting area to obtain the desired protection may not be possible. Sometimes, equipment such as pulverizers and pipe lines can be designed to withstand the pressure of an internal explosion, but such designs for large enclosures are seldom practical.

Selection of types of vents

In the average plant, reliance usually can or must be placed on vents to provide the desired protection. Determination of the proper ratio of venting area to volume and selection of the proper type of venting equipment are the problems that confront the plant engineer in such cases.

Unobstructed openings are the most effective vents for the release of explosion pressure. However, closures usually must be provided to protect against the weather, bar unauthorized entry, preclude dissemination of the material being processed, or prevent contamination of the product by the entrance of dirt or moisture from outside. A number of such appliances have been developed, and brief descriptions of some of the principal types will be given to aid in the selection of suitable equipment.

Windows—The type of vent most generally used for explosion protection is some adaptation of window sash or skylights. In some cases, the window frame is anchored only lightly in the building wall. Although the venting action is usually effective if an explosion occurs, such practice resembles the early sacrificial method, and in built-up areas blown-out window frames may endanger nearby property or cause personal injuries. In other cases the frames are well anchored, but the glass is held in place by light wire clips, plastic putty, or other means that will permit it to be blown out of the frames easily.

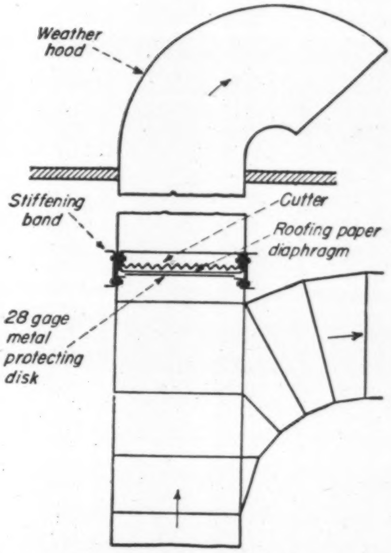


Fig. 3. One form of explosion pressure vent uses a paper diaphragm. The metal protecting disk, serving to prevent abrasion of the diaphragm, will blow free upon operation of the device.

Where the use of permanently set glass in well-anchored sash is necessary, protection can be obtained by scoring the glass on the outside with a glass cutter. The score, usually in the form of an X extending from corner to corner with a 2-in. break in the center of each line, weakens the glass until its resistance to pressure from within is only about 1/5 that of the unscored pane.

Several types of explosion-venting sash are hinged to swing outward under predetermined pressure from within. Such sash usually are equipped with a latch or friction device to prevent opening by the wind or by intruders. Under certain conditions, special devices are necessary to hold the sash open after it has operated until inside and outside pressures are equalized.

Diaphragms—Diaphragms of paper, metal foil, and both flexible and frangible types of plastics have been used as vent closures, and this form of protection against explosion damage has become quite popular. Such closures prevent the dissemination of dust, vapor, or gas and help to retain within the building the heat that would be lost through the openings if they were not sealed.

Ordinary types of paper may be used indoors. Light-weight building or roofing paper can be used at exposed locations where protection against the weather is necessary, but metal foil or plastic sheets may be preferable in exposed locations.

Diaphragms should offer as little resistance as possible to release of explosion pressure. It sometimes is advisable to install knife edges, saw teeth, spear points, or similar devices to start breaking or tearing of the sheet as soon as any unusual deflection occurs. Certain types of diaphragms can be designed to pull out of the frames that hold them in place over an explosion vent as soon as they bulge under internal pressure. A method of using diaphragms for vent closures is shown in Fig. 3.

Poppet-valve-type—Devices of this kind are generally used to provide explosion protection on tanks or equipment that normally must be kept closed to retain dust, vapor, or gas under slight pressure. The closures usually consist of plates or doors fitted with gaskets and held in place by the action of some type of spring. It is desirable to have a trigger action on the spring that will permit the door or plate covering to open wide if explosion pressure is produced.

Ventilator-vents—Combination ventilator and vent equipment normally provides for a certain flow of air through an opening in the roof or wall. Incorporated in the design of such equipment is a device that operates to provide an unobstructed opening when any unusual increase in air flow or pressure occurs. The venting parts of such equipment should operate easily and quickly to provide an opening of the size necessary to release any explosion pressure from the room or enclosure it is designed to protect.

Flume Crosses Canyon on a Rigid Frame

Contents in Brief—*An unusual solution of a design problem at a crossing of the Crooked River in Oregon resulted in the use of a rigid frame structure in place of an arch to reduce number of joints, avoid load concentrations, do away with secondary stresses in spandrel columns and keep cost down.*

AN AQUEDUCT DESIGN incorporating the rigid frame principle now widely used in bridge work was evolved recently by engineers of the U. S. Bureau of Reclamation in determining the best way to carry water for the 50,000-acre north unit of the Deschutes irrigation project over the Crooked River nead Bend, Ore. A structure capable of carrying 1,000 cfs. over the 150-ft. deep canyon had to be provided.

Width and depth of the canyon presented less of a problem than did the fact that the sides consisted of steep slopes of loose talus, much of it room size. This talus was a considerable menace to falsework and at first the plan was to use a type of construction that would make falsework unnecessary. In the end, however, other factors outweighed this risk and falsework was used successfully.

Evolution of design

When the project was studied in detail in 1941 the idea was that a suspension bridge carrying a 120-in. dia. pipe would be the simplest solution, and plans for such a crossing were accordingly prepared. Comparison with a steel arch showed the latter to be considerably cheaper and attention was then focused on the arch design. When support spacing was examined the great stiffness in the pipe itself made it clear that supports need not be close together.

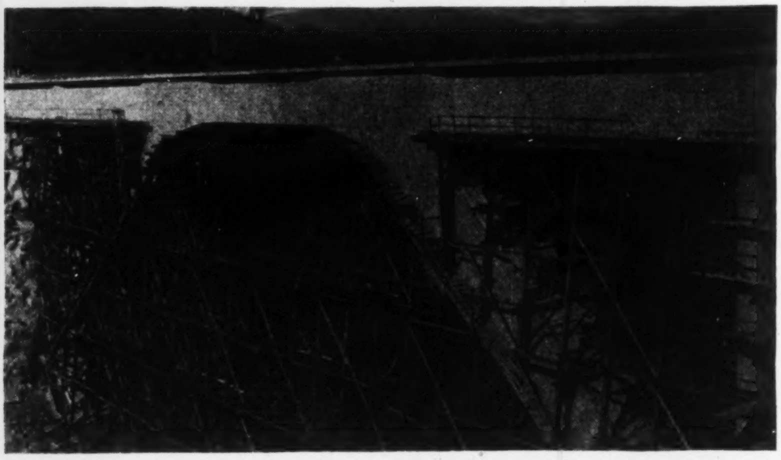


Fig. 1. High falsework was required to support forms for the reinforced-concrete rigid-frame flume across the Crooked River in Oregon. Below is shown the completed structure after the falsework had been removed.

Carrying this reasoning one step further led to modifying the arch design to a rigid frame consisting of two legs sloping at 45 deg. and supporting a third member built as a horizontal box girder. Final designs for a steel structure of this type were completed and bids were received in the fall of 1941. Before the contract could be awarded, however, the country was at war and for the time being the project was laid aside.

In the fall of 1943 the project was revived as part of the war food program, but because of the high priority need for plate steel, the proposed structure was redesigned, following the same general idea as to rigid frame but using reinforced concrete instead of steel. Construction in concrete has been completed.

Changes involved in the switch from steel to concrete required (1) provision for falsework founded on the talus slopes of the canyon and (2) further exploration of the canyon walls to make sure that foundations would be safe for the loads imposed by the heavier structure. To keep dead loads to a minimum, the inclined legs, like the horizontal girder they support, were designed as box girders. Diaphragms could be used in the legs but of course not in the horizontal box girder, which also serves as a flume.

Studies made to compare a concrete-arch design with the rigid frame that finally was adopted had shown the two structures to involve practically the same cost. However, there was a very considerable advantage in favor of the rigid frame with sloping legs in that the interaction of the relatively stiff concrete flume could be utilized effectively as a member of the structural frame itself.

This avoided the high and undesirable secondary stresses in arch span-

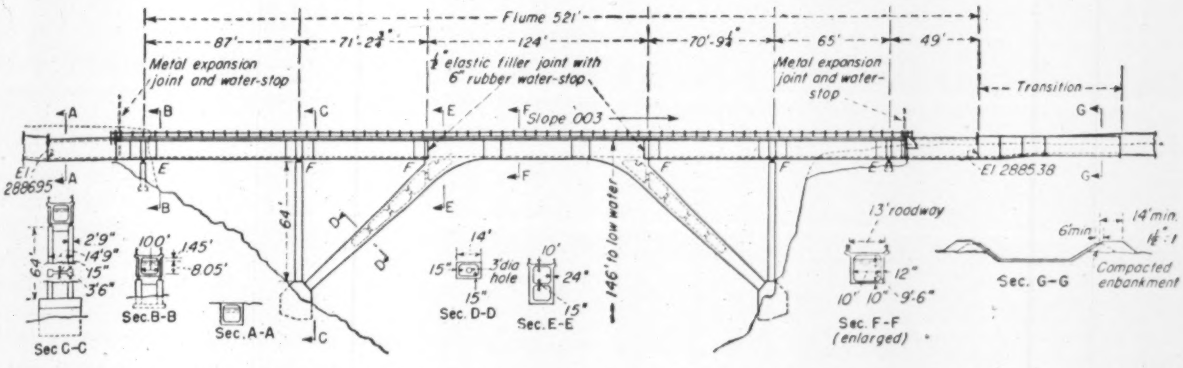


Fig. 2. Rigid frame design for the Crooked River crossing that was developed after steel became difficult to obtain. The flume was designed as a box girder that serves as the horizontal member of the main span.

drel columns and arch ribs that would have attended a design in which the flume was supported on an arch. These secondary stresses could have been reduced materially by using joints in the flume section at each of the spandrel columns. However, this in turn would have involved the use of many joints, which would be potential trouble spots in a flume carrying water. All these considerations added up to strong preference for the type of design adopted.

Details were worked out by the elastic theory making allowances for ach action and shrinkage. Allowance for temperature, with the flume full of water, was for the range of 30 to 100 deg. F.; with the flume empty the range was considered to be —10 deg. F. to 100 deg. F.

Saved 15 percent

Since the decision to change from steel to concrete was made after bids on the first designs had been received, opportunity was thereby afforded for comparing costs of the two types. In making such comparison, allowance had to be made for a lapse of nearly three years during which time construction costs have increased materially. Making what is believed to be proper allowance for price increases during this period, the contract for the concrete rigid frame is said to have been about 15 percent less than the bid price on the structural steel rigid frame, which was not built.

In planning the concrete pouring schedule, specifications were arranged so that the contractor would be required to divide the work into sections to keep the load reasonably well balanced on opposite sides of the main span. Specifications required that on the main span the two halves of the box girder that also serves as flume should be poured first. Subsequent to this came sections that are balanced or uniformly spaced on opposite sides of planes in which joints are provided.

All portions of members of the central rigid frame were completed before pours were started in any of the adjoining sections. The last section of the rigid frame structure to be put in place was a small "keystone" portion of the horizontal box girder at the center of the main span. The requirement was that this be placed not less than five days after completion of other portions of the rigid frame and only when the average air temperature of the immediately preceding five days was less than 60 deg. F. Hydraulic properties of the flume and the adjacent canals are given in a table.

Water first flowed through the flume over Crooked River on May 3, 1946, marking the successful completion of this feature of the Deschutes irrigation project. The project is in Region 1 of the U. S. Bureau of Reclamation, which is under the general direction of Frank A. Banks, director, R. J. Newell, assistant director. C. H. Spencer is construction engineer on the project. Contractors were David A. Richardson, of Santa Cruz, Calif., and McLaughlin Construction Co., Livingston, Mont.

HYDRAULIC PROPERTIES OF CANALS AND FLUME AT CROOKED RIVER CROSSING

Section	A (Area) sq. ft.	V (Velocity) ft. sec.	Q (Disch.) cfs.	r	n	s
Canal, above	128.98	7.76	1,000	3.60	.035	.006
Flume	80.00	12.50	1,000	3.16	.014	.003
Canal, below	365.14	2.74	1,000	5.54	.0225	.00017
Wasteway	78.00	12.82	1,000	2.33	.035	.0183

r—Hydraulic radius—water cross-section divided by wetted perimeter.
n—Coefficient of roughness of channel.
s—Hydraulic gradient—sine of slope of water surface.

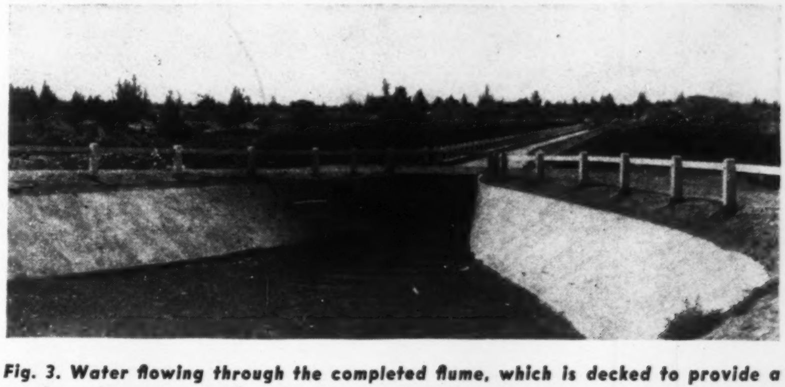


Fig. 3. Water flowing through the completed flume, which is decked to provide a roadway for patrol traffic over the Crooked River gorge.

A Quarter Century of Experience in Feeding Garbage to Hogs

***Contents in Brief**—Los Angeles food waste has been fed to hogs continuously for 25 yr. by the Fontana Farms Co. where 50,000 hogs are now kept. In two decades much mechanical equipment has come into use and many economies have been introduced. Factors affecting the quantity and hog-food value of garbage from a large city include the advent of refrigerators in the average kitchen, wartime food economy and the disappearance of the phonograph needle.*

> Some 21 yr. ago N. A. Bowers, a staff editor of this paper, wrote an article entitled "Los Angeles Garbage Feeds 40,000 Hogs on Fontana Farm." This article, which was published in the issue of Aug. 6, 1925, vol. p. 208, was based on data supplied by R. E. Boyle, then superintendent for the Fontana Farms Co. In 1946 Dr. Bowers again was received at Fontana by the same R. E. Boyle, now the president of the company. Some of the things in garbage feeding that have been learned and other developments in these two decades of experience are told in this article.—The Editors

One of the older means of municipal garbage disposal, the merits of which were once widely debated, is hog-feeding. A huge operation of this kind has been conducted continuously in the Los Angeles area for some 25 years, and it holds more than academic interest with meat shortages what they are.

Los Angeles householders maintain separate garbage cans for hog food. Through years of enforcement of a city ordinance the citizens have become accustomed to using one garbage container exclusively for food wastes and another can for refuse that has no food value. This has made possible the separate collection of garbage suitable for hog feeding in amounts that have varied, through the years, from 225 tons (in 1922) to a maximum of about 600 tons per day just prior to the war. During the war the daily collection fell off to about 450 tons, despite the greatly increased population that was brought to the city by war industries.

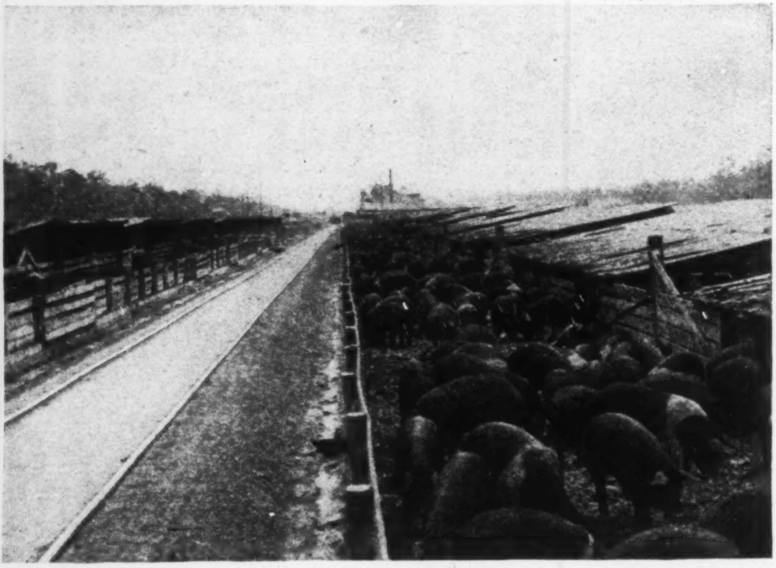


Fig. 1. These 125-lb. hogs, 6 mo. old, are admitted to the concrete feeding floor after garbage is unloaded with the aid of a locomotive crane and clamshell.

The garbage is moved in tarpulin covered gondola cars (about 40 tons to the car) 50 mi. from the loading depot in the city to the feeding pens of the Fontana Farms Co. Here the same management at the same location and to some extent using the same equipment has been feeding garbage to hogs for 25 yr. Since publication of an earlier article on this operation (*ENR* Aug. 6, 1925, vol. p. 208) there has been little change in the methods of unloading and feeding garbage. This is still done by a locomotive crane pushing a gondola car along a track bordered on both sides by feeding pens. A clamshell on the crane boom lifts garbage from the car and deposits it on the concrete feeding floors on either side.

In other particulars, however, such as mechanical equipment for collecting waste, methods of waste disposal and the general handling of the animals, there have been numerous improvements and refinements growing out of long experience under the same management. In the early years of the farm the preferred breed of hogs was Duroc. Later it was decided to change to Hampshires and this breed is now used almost exclusively.

Quarter century brings changes

One of the most marked changes in a quarter century is the decrease in food value of the garbage received. The advent of refrigerators in the average home enormously reduced the amount of food waste. Because refrigerators prevent food from spoiling there was a resultant decrease in the food put into the garbage can. That is, food no longer suitable for human

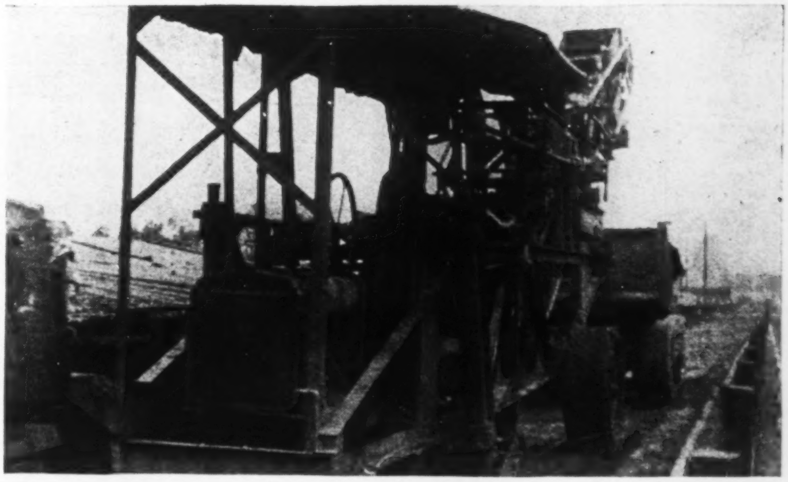


Fig. 2. This specially-designed loading rig is scooping up remnants and waste from the feeding floor. At extreme left is part of the towing tractor. A dump truck is being loaded under discharging conveyor at right.

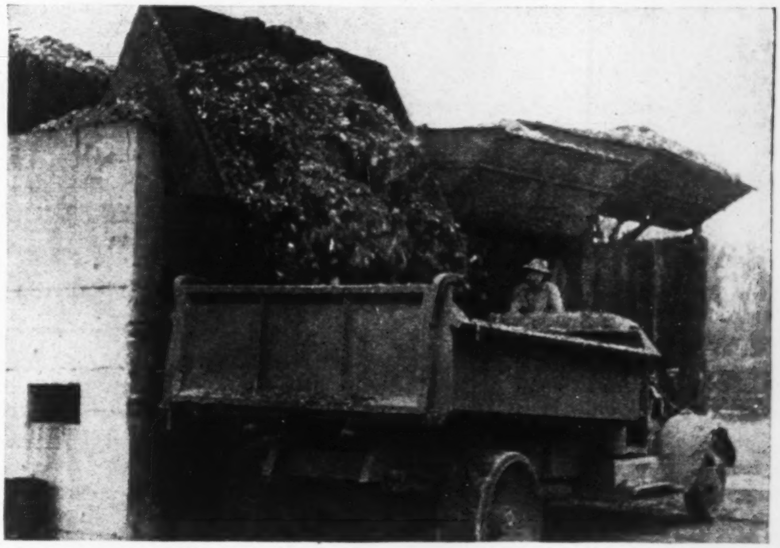


Fig. 3. As each garbage train arrives, six truck loads are temporarily stored in tiltable bins by the clamshell. This is a convenience for loading trucks later while the crane is busy elsewhere.

consumption but still valuable as hog food. Of course wartime conditions, with the drive to conserve food, salvage all fat wastes, etc., not only decreased the quantity of garbage waste, but it also materially lowered its value as hog food.

However, not all the changes that have come with the years have been unfortunate for the hogs: The advent of the radio in thousands of homes resulted in an effect on the garbage can greatly to the advantage of Mr. and Mrs. Hog, namely, the almost complete disappearance of the phonograph needle in food waste. In the early years of hog farm operation these small steel points, eluding the usual care of the animals in avoiding dangerous objects, were eaten with food and caused a considerable percentage of the hog mortality. Now phonograph needles have practically disappeared from garbage.

A serious current problem, particularly since the emphasis on conserving grain for feeding foreign nations, has been the difficulty of getting the usual supplemental rations so necessary in preparing garbage-fed hogs for market. Not only have grains become practically unobtainable for hog feeding but there has also been difficulty in obtaining the soy bean meal, fish meal and meat scraps which once pieced out the garbage rations. Green-cut alfalfa is still used to supplement garbage fed to sows and suckling pigs.

To facilitate accurate control of food rations at the farm and to insure a balanced diet, garbage is sampled and analyzed once a month. The test is made on a sample from a tub into which have been emptied four or five buckets of garbage, each taken from a different gondola car. The sample is assayed primarily for proteins and vitamins, using standard chemical analysis methods.

What the decrease in garbage food values means is best indicated by the fact that in 1921 there was a gain of 68.9 lb. of pork per ton of garbage fed. This has gradually decreased through the years until now the gain is only 24.5 lb. of pork per ton of garbage fed.

These figures are exclusive of results of grain feeding, the effect of which is precisely known, and hence can be deduced accurately. If the usual 400 lb. of grain per ton of garbage is fed there is a gain of 1 lb. of pork for each 4 lb. of grain. With a pork gain as low as present figures per ton of garbage it is necessary, of course, that supplemental food also be provided. This has become increasingly more difficult. In 1944 Fontana Farms sold 9,324,300 lb. of pork. In 1945 the various factors that curtailed output decreased the quantity of pork produced by almost half a million pounds.

Despite many experiments, no way has been found to prevent the rapid erosion and raveling of the surface on concrete feeding floors which is ascribed largely to acetic and other garbage acids. The erosive action eats away the cement matrix, leaving aggregate particles projecting.

Life of the surface can be prolonged somewhat by hardening it with three applications of silicate of soda about 2 days apart, before the freshly poured concrete is put into service. These applications are made by brushing the material on in the following combinations: First coat, one part silicate to two parts water; second coat, equal

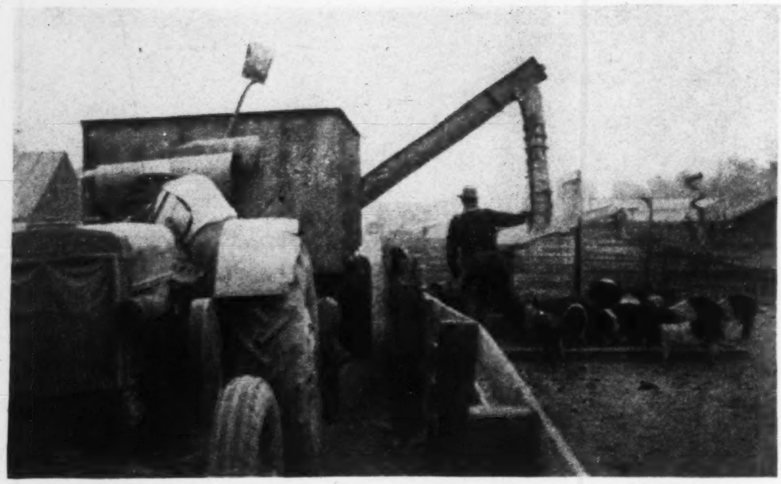


Fig. 4. Grain is fed from a trailer with one screw conveyor along the V-bottom and another in the inclined arm at the rear end. Note "elephant trunk" made of nested, bottomless buckets.

parts of silicate and water; third coat, two parts silicate to one of water.

When concrete feeding areas get so badly worn that the clean-up becomes difficult, usually in 2½ to 3½ yr., the surface is carefully cleaned by hosing it off and then a new concrete finish is troweled on. The extreme roughness of the worn surface caused by partly exposed aggregate makes possible an excellent bond.

Waste collection and disposal

About one-third the weight of fresh garbage dumped on feeding floors is later taken from those floors as a mixture of inedible material, waste, refuse, and manure. Gathered up and loaded on dump trucks by a power loader specially designed for this work, this waste goes to spreading grounds to be dried. (The compost pit described in the previous article was not a success because it contents "would not silo" but soured instead and produced excessively bad odors.) The present program is to dry the waste on areas totaling 35 acres kept available for this purpose. About 8 acres (200,000 sq.ft.) of this drying area is paved with concrete; the remainder is bare land. The paved areas, so far as possible, are reserved for dry weather dumping to facilitate access.

The method of spreading is to deliver from dump trucks in piles roughly lined up in rows with spacing between piles and between rows such that after spreading, the average thickness will be about 10 in. Spreading is done in several steps, all accomplished by mule power. The first step is with a plow pulled by two mules hitched to a long whiffletree. This allows the mules to walk on either side of a row of dumped piles while the plow follows down the center and opens them up. Later successive plowings complete the spreading. After the spreading is completed to the desired depth, gypsum is spread over the drying waste at the rate of about 20 lb. per ton of dry waste.

Tractors were found unsuited to this work largely because of the tendency for crawler treads to foul up with the heterogeneous mess that is being spread.

Weather is the all-important factor in rate of drying. Rainfall at Fontana, which averages about 17 in. yearly, comes mostly between November and March. For the other three-fourths of the year the 10-in. layer of wet waste material will dry to a consistency of about 30 percent moisture content at which it can readily be sold for orchard fertilizer. The sale price nets $7 per ton to the farm, f.o.b. truck at the drying area.

Formerly this waste was fairly free of glass (bottles) and tin cans by reason of the segregation of these materials by hand before waste went to the drying areas. Now that such foreign material can no longer be economically removed, the waste has to be sold "as is." The percentage of such material has not been excessive, at least not so large as to have prevented sale of all that has been produced so soon as it is fairly well dried

However, it is anticipated that whe scarcity of labor, high prices and other disturbed conditions now obtaining have been alleviated and conditions have returned somewhat nearer to the normal, it will again be necessary to deliver a better-prepared fertilizer, probably by putting it through grinder and screen. A grinding plant for this purpose, which also included the removal of cans, bottles, etc., was installed years ago at the Fontana farm but of late it has not been feasible to operate the plant.

Typical analyses of fertilizer values in the waste material show it to contain the following: Nitrogen 2.25 percent, organic matter 60 percent, phosphate 1 percent and potash 0.5 percent. It should be noted, however, that in this case the chemical analysis showing phosphate does not distinguish between the kind readily available and that in the form of bone, which does not become available for several years.

The hogs are kept in groups of equal age and weight to facilitate uniform control of food. When they are moved from pen to pen, they are transferred as a group. When a pen is vacated the waste that has been scattered about in the pasture area and hence has not been removed in the periodical clean-up of the concrete feeding floors, is raked together in piles and loaded into dump trucks.

This clean-up waste is in two classes: First, bones, which have a salvage value and, second, refuse that has no value, such as tin cans, broken bottles, etc. Although it is strictly against the Los Angeles city ordinance to place any such articles in the can supposed to be used exclusively for food waste, yet considerable quantities of these items do appear on the feeding floors. Bones in quantity are carried away from the feeding floors by the animals and later must be gathered up in the pens. Bones pay well for the pickup

TONNAGE OF GARBAGE FED EACH YEAR AT LOS ANGELES' HOG FARM

1923	118,257	1935	164,802
1924	134,740	1936	162,050
1925	133,923	1937	160,040
1926	141,407	1938	170,605
1927	156,991	1939	174,718
1928	158,728	1940	175,852
1929	166,620	1941*	143,062
1930	156,314	1942	148,608
1931	167,635	1943	132,562
1932	173,275	1944	138,994
1933	171,242	1945	152,228
1934	157,480		

*10 mo. period

and segregation as they are now sold for $24 per ton. Last year a total of 618 tons of bones was picked up and sold. This represents an average of about 8.1 lb. of bones per ton of garbage fed.

Cans and bottles gathered in the cleanup are disposed of by putting them in the pit made by excavating gravel for use in laying concrete paving. Holes made by removal of the gravel are filled with the cans and bottles and then covered over with earth.

Mechanical equipment

Although tractors cannot be used for spreading waste, many pieces of mechanical equipment have been introduced in other phases of the farm operation. The most outstanding of these is the combination loading machine that cleans up everything left on the long lines of concrete feeding floors. These feeding floors are so arranged that when the hogs have finished eating and are turned back into their pens, the gate-like partitions are swung away and the long feeding floor is free of obstructions from end to end. The waste-loading machine, pulled by a tractor, moves onto this floor followed closely by a dump truck which backs up under the discharging end of the elevator conveyor.

At the front end of the loading machine a pair of shear boards gathers the waste material into a central windrow which is picked up by an elevator conveyor consisting of steel plates set vertically at intervals between the driving chains. The chains are attached to the plates at both ends and hold them upright. This conveyor has an overhead return so that the plates come down into the windrow from above, and drag the waste material onto the inclined, steel surface of a shallow trough whose discharge end is well above the sides of the following dump truck. The truck moves backward in order that only the dump body need be under the discharging conveyor at any time. This is a decidedly "messy" operation as the waste has a high moisture content and material falling from the discharge end of the conveyor will usually splash and spatter considerably.

Just before the loading machine starts to move over a feeding floor a mule-drawn scraper with a light drag-mounted blade or "edger" builds up a central windrow. The mules drag blades that work along each edge of the floor and scrape the waste out into the central portion of the floor. After this preliminary scraping the shear boards on the loader are able to pile the waste effectively into windrow shape convenient for pickup by the chain conveyor.

Mechanical equipment that has come to be a necessary and constantly used part of the working tools of the farm is listed as follows:

Fig. 5. After only 2 yr. of garbage contact this concrete feeding floor (not silica-soda treated) has become extremely rough. The small projections are firmly bedded aggregate: the surface had just been thoroughly hosed.

1 8-wheel locomotive crane for feeding garbage (Link Belt)

2 ⅜-cu.yd. power shovels

1 automatic grain feeder (job-made, Fig. 4)

1 tractor (Caterpillar)

1 power shovel for loading grain or fertilizer (John Deere)

1 feeding-floor refuse-loader (job-made, Fig. 2)

32 trucks and automobiles

In addition to this list there are enough gondola cars, used exclusively in hauling garbage, to make up two trains of 16 to 20 cars each with a few extras usually left at the loading depot. One train daily is hauled to Fontana where the train crew picks up for the return trip to the city, the empty cars delivered the preceding day.

The hogs are fed twice daily. Garbage not used in the first feeding is left in the tarpaulin-covered cars until time for the second feeding. Garbage is not collected in the city on Sunday so the farm has to carry over enough from Saturday to last until Monday. Each time the cars are emptied they are cleaned by steam and resultant wash water is used for irrigation.

In addition to mechanical equipment about 30 horses and mules are used at the farm on work for which tractors and trucks are not so well suited.

Hog health control

Experience at Fontana has emphasized the fact that hogs should be fed (or, more properly, should have access to) only so much food as they will clean up. Any other program results not only in waste of the uneaten food but gives the animals a sickly tendency.

However, allowance should be made for the relative hunger or "eating capacity" of animals in different stages of development. The rapidly growing hogs of less than 100-lb. weight require pasture for exercise and they get hungrier than do older animals in the fattening pens where they get very little exercise. Only best quality garbage is fed to the animals being fattened. After they have eaten what they want and are returned to their pens, the rapidly growing animals are admitted to the feeding floors to "clean up." Later, of course, the young hogs are given whatever additional food is considered necessary.

Brood sows average about six litters in the 3½ yr. that has been found desirable to keep them for breeding purposes. At Fontana the practice is to wean pigs at an average age of 12 weeks and to make estimates based on two litters in 14 mo. This is in contrast with the practice, in Eastern states, of weaning in 8 to 10 weeks and expecting two litters per year.

Very special care is given the sows at farrowing time and to the little pigs prior to weaning. The result has been that of the average litter of 6.3 pigs an average of 6.0 safely reach the weaning age. An average of 5 to 5.5 pigs per litter survive to reach the fattening row where they are prepared for market at an average weight of 225 to 240 lb.

When the pigs are 5 weeks old they are vaccinated. Later, to make sure the vaccination "took" there is a check for reaction. An idea of how much of a program this involves will be apparent from the fact that Fontana Farms has been using about 2,500,000 cc. of vaccine per year.

Instead of a full-time resident veterinarian, which used to be the plan, the veterinarian now spends 2 days a week at the hog ranch, during which time he directs a crew of five full-time employees who regularly devote part of their time to this assignment. This crew, with the coaching they get from the doctor, is highly efficient in handling vaccinations and other routine matters affecting animal health.

The function of this crew is to minimize hog deaths. Less than ten deaths per day, as a total for animals of all ages, is considered a good record for a 50,000-hog operation. This is less than 7¼ percent per annum and is rated as a very low "nominal" death rate from such causes as pneumonia, ruptures, faulty castration and the loss of little pigs prior to weaning time. This favorable death rate figure does not hold, of course, in times of epidemics, such as the scourge of hog cholera that struck the farm some 6 yr. ago and killed 1,600 hogs. Heaviest losses among pigs under weaning age is caused by vesicular exanthema, against which there are no known preventive measures. Once a month autopsies are made on hogs that died the preceding day from unknown causes.

Particular care is taken in cleaning up all inclosures, brooder pens and feeding floors after a group of hogs is transferred to a new location and before other animals are turned in. The farrowing pens are given particularly careful cleaning, are hosed out and sprayed with disinfectant. Clean bedding, consisting of straw or coarse shavings, is then put down in the roofed portion of each compartment. In addition, in one corner of the clean concrete floor a spadeful of fresh, clean earth is deposited for the young pigs to nibble on. This is an important preventive of anemia. All brooder pens are periodically treated with a fly spray consisting of cresylic acid, oil of mirbane and distillate.

While the price of much that a hog farmer needs to buy in the open market has been increased with OPA sanction, the price of pork has been kept down. For example, grain prices have increased $12.20 per ton in the last 2 yr. This advance has not been accompanied by a commensurate increase in pork prices. The pork increase has been only 5 cents per hundred pounds, as this is written, and under OPA limits pork is selling on the hoof, f.o.b. Los Angeles, at $15.30 per hundred.

The food waste from Los Angeles scavenger collections has been sold since the fall of 1921 to the Fontana Farms Co. under successive contracts, the last of which expires in September 1951. After that date it is expected that a new contractor and a new farm site will have to be found. Residential development around the original farm tract is expected to be such as to make inadvisable the continuation there of a large hog-feeding operation.

Operation of the Fontana Farms Co. ranch is under the direction of R. E. Boyle, president. Frank Williams is vice-president and manager of the operations.

Four Columns Support Large Stadium Roof

Just before the war the city of Zurich, Switzerland, completed a large stadium whose 107,640 sq. ft. of area is covered by a steel-frame roof in an unusual structural layout that the war blackout prevented from being described in American engineering literature. An article in the publication of the Belgium-Luxembourg Steel Association, *L'Ossature Metallique*, for January-February, 1946, now permits that omission to be rectified.

The stadium is primarily for bicycle racing, although many other types of athletic events and pageants have been held in it. Accommodations are provided for 11,000 spectators—8,000 seated and 3,000 standees.

Built in the form of an ellipse with axes of 400 ft. and 350 ft., the large roof area is carried by only four columns, and these are so placed near the wall that they are hardly visible. A hung ceiling of asbestos sheet also hides all of the roof framework, except the lower half of the four main trusses, which have a depth of 33 ft. The roof covering consists of lightweight concrete resting on timber purlins.

The total load of roof plus snow load amounts to 4,972 kips. Adding the 84 kips in the columns gives a total of 2,528 tons of which 600 tons is carried by the exterior wall, and 1,928 tons by the four columns. A total of 740 tons of structural steel was required.

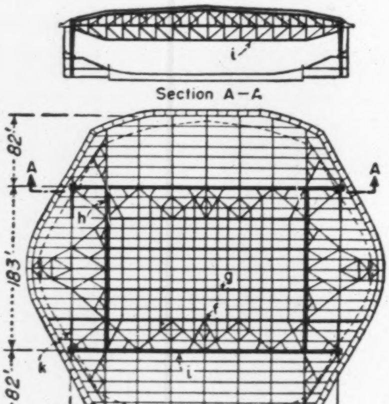


Fig. 1. Roof framing showing four supporting columns and main framing members in heavy black lines.

The four columns are placed at the corner of a rectangle, 183 ft. in one dimension and 300 ft. in the other. These columns support in a transverse direction two main trusses (*i* of Figs. 1 and 3) of 300-ft. span into which are framed, 38 ft. from the columns, two longitudinal trusses *h* of 183-ft. span. The latter trusses are offset from the columns in order not to interfere with the balcony seats along the side of the stadium. Framed into the longitudinal trusses are four transverse trusses, *f* and *g*, of 224-ft. span and about 16-ft. depth. The remaining secondary framing, for wind bracing and roof covering support, is indicated in Fig. 1. The beams of that part of the framing spanning between the main trusses and the exterior walls are carried on movable supports so as to isolate the wall from stresses resulting from deformation

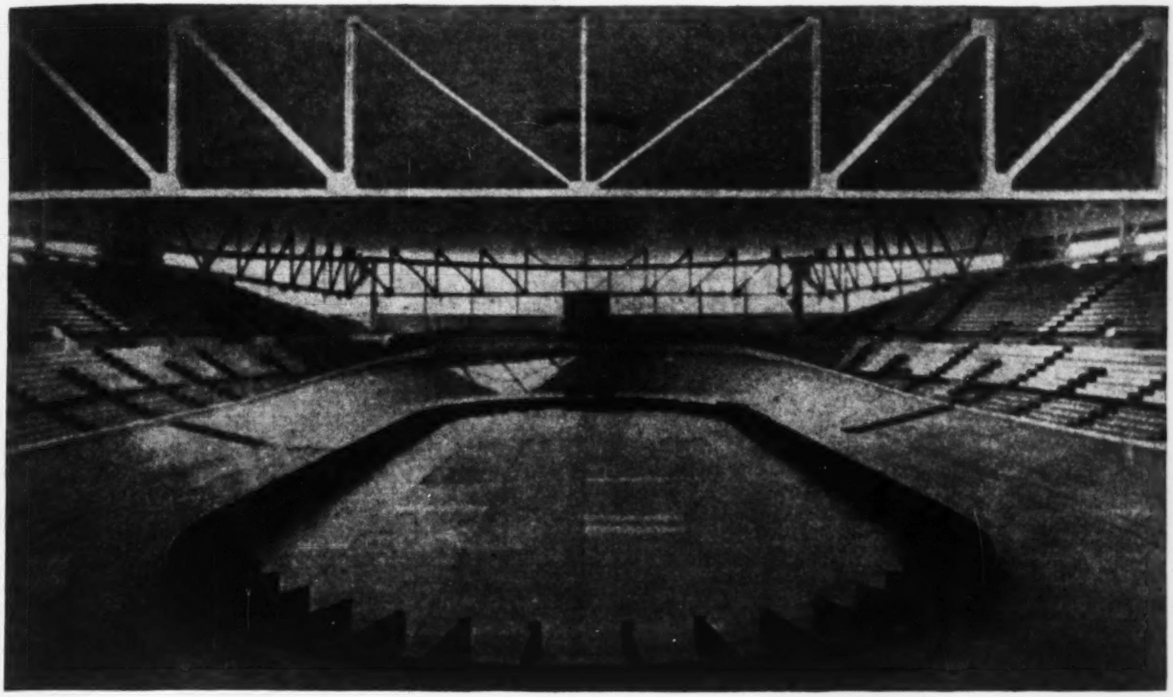


Fig. 2. Zurich stadium as it appears when the arena is arranged for bicycle racing

of the principal framework of the building.

The four columns rest on cast steel swivel bearings. In addition, the joint at the top of three of the columns permits rotation as well as horizontal movement of the trusses and roof framework (as shown in Fig. 3) while the joint at the top of the fourth column is fixed. With this arrangement, horizontal loads are not transmitted to the columns, an important consideration due to the fact that the columns rest on concrete posts 33 ft. high. To permit these posts to resist horizontal loads would have necessitated supplementary construction of very great cost.

Three types of columns

In summation, there are three types of columns as determined by the joints at their tops. Referring to Fig. 3, column *a* is fixed, columns *b* and *c* permit displacement in only one direction as indicated by the arrows, and column *d* permits movement in two directions, also as indicated by the arrows. One other special piece of framing is required to make the system statically determinate and at the same time to permit the roof to follow the displacement of the columns without stressing the exterior walls. This framing is represented in Fig. 3 by the special beams *k*, designed to carry horizontal end loads into the longitudinal trusses *h*, which, as noted, are not on the column lines.

The main trusses, *i*, are fabricated of high strength steel, St. 44, permitting 20 percent higher working stresses than with steel of normal type. The choice of web system for these trusses was influenced by the fact that only the lower part would be visible when the building was completed. For the other framing, ordinary St. 37 steel was judged sufficient.

The main beams, of which the lower chords are situated 43 ft. above the level of the ground, were erected by means of metal falsework, and the points of support were adjusted by hydraulic jacks.

Those responsible for the design and erection of this stadium were Karl Egender, architect, E. Rathgeb and R.-A. Naef, engineers, and the fabricating firm of Eisenbaugesellschaft of Zurich.

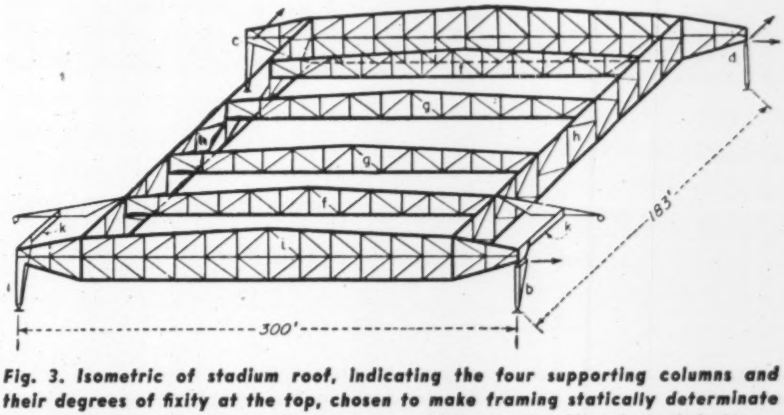


Fig. 3. Isometric of stadium roof, indicating the four supporting columns and their degrees of fixity at the top, chosen to make framing statically determinate and to eliminate bending in the columns, which are also hinged at their bases.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Fontana Reservoir Causes Ground Settlement

Sir: Recently, measurements were made to determine the settlement of the ground in the vicinity of Fontana Dam due to the weight of the dam and of the impounded water. The dam has an overall height of about 480 ft. and a net difference between maximum headwater and tailwater of about 440 ft.

The reservoir was filled for the first time in June of this year. Before the filling, a line of precise levels had connected the toe of the dam with certain bench marks of the U. S. Coast and Geodetic Survey located some five and one-half miles away in airline and eight miles by way of the access to the dam. This line was surveyed with a first-order U. S. Coast and Geodetic Survey model dumpy level and invar-strip level rods. The leveling was executed during daylight in accordance with first-order methods.

Similar levels were run during June of this year. The measurements showed that bench marks at the toe of the dam were lower than before the filling of the reservoir by 0.082 ft., almost exactly 1 inch. The probable error of the measurement was calculated as 0.009 ft. Inasmuch as the original reference line was run after the concrete of the dam had been substantially placed, the settlement reflects the influence of the weight of the water in the reservoir.

At a distance of three-fourths of a mile from the dam the change of level was 0.036 ft. or a little less than one-half the maximum. From this point on the measured settlement gradually diminished to zero at the reference point.

Similar surveys on top of the dam showed that at the easterly end there was a drop of approximately 0.03 ft. as compared with the center of the dam, at which point the regional levels had been tied in. Inasmuch as the dam was built at a sharp bend in the river and the east abutment is on the convex bank, it would appear that the weight of the reservoir water would have a somewhat greater effect at this end of the dam than in the center or at the opposite end.

These observations illustrate the fact that there is no such thing as absolute fixity of foundation. They also appear to be in substantial accord with observations of similar settlement as reported from Boulder Dam.

C. E. BLEE
Chief Engineer
Tennessee Valley Authority

Cuts in Federal Work

Sir: The editorial, "Federal Construction Cost," in the Aug. 22 issue of *Engineering News-Record*, vol. p. 225, has come to our attention. We believe that certain qualifications would have given a clearer view of the situation.

It may be that, owing to the material situation, curtailing certain federal construction for a while may have some effect in checking the upward spiral in costs. We believe, however, that today's costs will not be appreciably lower in the foreseeable future; that the delay will not be effective with respect to ultimate savings. Flood control (cutoffs and levees along the Mississippi and its tributaries) and waterway improvements require no considerable volume of materials now urgently needed elsewhere.

The loss and disruption caused by rivers in flood is certainly enough urge to continue flood prevention work. The worth of our inland and intracoastal waterways, harbors, and channels can best be evaluated through picturing the nation without them. They require constant development and maintenance; interruption simply adds to ultimate costs.

During the war there was practically no flood-control or navigation improvement work done except that urgently needed in the war effort. As a consequence, that type of work is way behind. A reasonable volume, which the Corps of Engineers believe should be begun immediately, was approved by Congress and provided for in the War Department Civil Functions Bill, passed in April and approved by the President on May 2.

As we stated in a recent release to newspapers, "It's billions we should be after and where it won't hurt, not a few tenths of that amount cut away from where there is real need for it."

WENDELL PHILLIPS DODGE
Editor, The Marine News
New York, N. Y.

Laterally Unsupported Beams

Sir: In the Sept. 5, 1946, issue vol. p. 321, Truman P. Young explains an interesting shortcut for obtaining the capacity of a laterally unsupported beam under the new specification of the American Institute of Steel Construction.

This shortcut will be included in the new edition of the AISC manual "Steel Construction", now in the printer's hands and shortly to be placed on sale.

In that handbook, at the top of each column in the tables of allowable uniform loads for beams laterally supported, the maximum laterally unsupported span for which a bending stress of 20,000 psi. is permitted, will be given, rounded to the nearest half foot. For any given problem having a span in excess of this maximum, the permitted working stress will be in the same ratio to 20,000 psi. that the tabulated maximum is to the required span. The same ratio can be applied to the tabulated load for a laterally supported beam, in order to quickly determine the uniform load which would be permitted if the beam were not laterally supported.

Also included in the manual will be a set of charts by which the designer, having determined the net bending moment to be carried on a particular span, may see at a glance what beams fully meet the requirements of the specification and, thereby, can select the one best suited to his requirements. These charts however, do not include American standard I beams and channels, which because of their narrow flanges are generally uneconomical for use without lateral support.

T. R. HIGGINS
Director of Engineering
American Institute of Steel Construction,
New York

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

Stability of Turbines

Considerations sur le Probleme de la Stabilite—By Daniel Gaden. 253 pp. Published by Editions la Concorde, Lausanne, Switzerland. 21 francs (paper).

M. Gaden, well known as joint author (with M. Calame) of a work on surge tanks, has now clarified the theory of the regulation and hydraulic stability of water turbines, particularly those in which water hammer is important. By the use of "relative values" and derived constants which are either dimensionless or dimensionally equivalent to time, the complex interaction of the governor and its compensation, the turbine and the water column is reduced to relatively simple formulas and charts.

The effect of a continued sinusoidal gate motion of small amplitude is analyzed as a means of studying hydraulic stability, and parallel operation of units or plants is also dealt with.—*Reviewed by* R. A. Sutherland, *hydraulic engineer, Ebasco Services, New York.*

Airbases in the Pacific

Builders for Battle—By David O. Woodbury. 415 pp. E. P. Dutton & Co., New York, $7.50.

This book on the construction of the naval airbases in the Pacific would be worth while and worth reading even though it were only half as well done, for the histories of too few of our great construction enterprises are ever written. Actually, "Builders for Battle" is excellently organized and admirably written. Moreover, by personalizing events and interlarding chronological description with anecdotes and background, a unique type of history results that presents construction as the significant, exciting, tough, adventuresome calling that it is.

Contracts NOy-3550 and 4137 and their various supplemental agreements, which are the basis for the book, started out at a $63 million figure and wound up at $330 million. They began as a joint venture of three contractors and ended up with eight firms, each large scale specialist operators in their own right, in the organization. They were initiated when war with Japan seemed inevitable and ended when actual warfare made it necessary to replace civilian construction men with Seabees on outlying bases. They were initiated as a great gamble against time to make our nation secure against attack from the west and were closed when that attack came, but not before the gamble had paid off handsomely if not completely. They constituted, in the words of Admiral Ben Moreell, wartime Chief of the Bureau of Yards and Docks, in an introduction to the book, "the greatest single contract in the history of the world in point of money value, diversity of character, dispersion over vast distances . . . . and effect on the security of the nation." They set the stage for a drama having the following essentials:

Time: From 1939 through Pearl Harbor.

Place: Pacific Ocean from Hawaii to Wake Island.

Principals: Turner Construction Co.; Raymond Concrete Pile Co.; Hawaiian Dredging Co.; Morrison-Knudsen Co.; J. H. Pomeroy & Co.; W. A. Bechtel Co.; Utah Construction Co.; Byrne Organization.

Supporting Cast: Executives, superintendents, foremen and construction workers of the principals; Albert Kahn Associated Architects and Engineers; various eminent consulting engineers.

Director: Bureau of Yards and Docks, U. S. Navy.

Every reader will have his own favorite chapters. Some of those of unusual interest cover the attempts to get a reluctant Congress to appropriate money; the selection of the contractors; the real story of Wake Island; the high-pressure work at Midway; the underground oil storage at Pearl Harbor; the secret emergency field on an awash-reef known as French Frigate Shoals; the construction man's view of the Pearl Harbor attack; and the radio antennae strung between the almost inaccessible mountain tops across Haiku Valley on Oahu.

In addition to Mr. Woodbury's good story, much is added to the book by 25 full-page drawings by Lili Rethi, outstanding artist of construction scenes, and by clear, attractive maps and sketches by H. Ruyl. Even the title, which recalls one used on an *Engineering News-Record* editorial in 1939, "Building for Battle", is appropriately chosen. "Builders for Battle" is a good war book and a fine construction history.

Mississippi Valley Geology

Geological Investigation of the Alluvial Valley of the Lower Mississippi River—By Harold N. Fisk. 781 pp., numerous plates and maps. Published by the Mississippi River Commission, Vicksburg, Miss. Limited edition.

Of profound interest to engineers are the findings, set forth in this publication, relating to the alluvium in the lower Mississippi River valley as affecting engineering works. The investigation required three years of unremittent labor at a total cost of nearly a quarter of a million dollars and is regarded as an outstanding achievement in engineering-geology. The information obtained fills a long-felt want on the part of engineers concerned with levee construction, seepage problems and river-channel maintenance in the Mississippi Valley, and should prove of practical value in similar problems elsewhere.

The report shows that the alluvium, long taken for granted as made up of haphazard deposits of silt, sand and gravel, possesses a distinct pattern, which tends to repeat itself with little variation except where affected by tributary deposits. This pattern furnishes the key to sub-surface conditions that influence the stability of structures, promote or block seepage, and determine the degree of erodibility of river beds and banks.

Efforts to attempt such an investigation some ten years previously proved futile for lack of physical data. By 1941, however, when the present investigation was undertaken, 16,000 logs of borings had become available through the courtesy of state highway departments, railroads, well drillers and oil companies. Additional borings were made by drill crews of the U. S. Engineer districts and of the Waterways Experiment Station. Excellent topographic maps and aerial photographic mosaics also were available. These, carefully interpreted, contributed much information regarding the earlier stream courses extending back over a period estimated roughly at more than a thousand years.

The mosaics, furthermore, proved of assistance in tracing the presence of the many fault lines, which traverse the basement rocks of the valley. Although the alluvium ranges in thickness from about 100 to more than 300 ft., the displacements caused by faulting were found transmitted to the surface, discernible in aerial photographs.

The report contains excellent maps showing the successive courses of the Ohio and Upper Mississippi rivers before these streams united at Cairo. It is shown that the alluvial deposits of more recent geologic times have been lighter than is commonly supposed, in fact, failed to obliterate the early river courses. No noticeable aggradation of the present river bed has taken place for over a hundred years. The natural levees built up by the river during this period are no higher than those of many centuries ago. — *Reviewed by* GERARD H. MATTHES, *consulting engineer, New York.*

Survey of Mathematics

DEVELOPMENT OF MATHEMATICS—Second Edition, by E. T. Bell. 637 pp. McGraw-Hill Book Co., Inc., New York 18 and London. $5.

Not a history of the traditional kind but a narrative of the decisive epochs in the development of mathematics, this book indicates why certain things continue to interest mathematicians, engineers, technologists and scientists. Only main trends of the past 6,000 years are considered, and these are presented through typical major episodes in each. The new edition amplifies many topics and includes striking recent advances.

The importance of mathematics, from ancient times to the present, as the primary source of workable approximations to the complexities of daily life is generally appreciated. But, as the author demonstrates, it is not true that the economic motive has been more frequent than the purely intellectual in the creation of mathematics. This holds for practical mathematics as applied in commerce, including all insurance, science, and the technologies. For example, tensor calculus was seriously taken up by mathematical physicists only after their curiosity had been aroused by the experimentally verified mathematical predictions of relativity. On the other hand, the historical balance sheet shows that science and modern mathematics are so closely affiliated that neither owes the other anything, each borrowing freely from the other and repaying its debts a hundredfold.

Mathematics has contributed to civilization two things that promise to be of enduring worth: the method of deductive reasoning as it has developed in technical mathematics and the mathematical description of natural phenomena.

Miscellaneous Notes on Booklets and Reprints

A DICTIONARY OF ENGLISH-SPANISH engineering terms, by Francisco Gaston of the Engineering School at the University of Havana, has been published by the Sociedad Cubana de Ingenieros and can now be obtained in pamphlet form from the society, 258 Avenue de Delgita, Havana, Cuba.

"Flood Flows and Stages in Sacramento and Northern San Joaquin Valleys, 1944-1946" is the eleventh of a series of reports on this subject covering a 33-year period prepared by the Division of Water Resources, Department of Public Works, State of California. The report presents data on daily mean and crest flood flows and stages at 109 gaging stations and an account of the functioning of the Sacramento River Flood Control Project between the fall of 1944 and the spring of 1946.

ANOTHER ACCOUNT of the great contributions made to the war effort by large engineering and construction firms is found in "A Report to the People" just published by the Stone & Webster Engineering Corporation. Because of the confidential nature of the projects described at the time they were under way, most of the information and many of the numerous photographs have never been published before. One cannot look through this 150-page book without being impressed with the versatility that was required to meet the many tasks undertaken by Stone & Webster during World War II.

New Engineering Books

MATHEMATICAL METHODS OF STATISTICS—By Harald Cramer. 575 pp. Princeton University Press, Princeton, N. J. $6.00.

CITY AND REGIONAL PLANNING PAPERS—By Alfred Bettman. 287 pp. Harvard University Press, Cambridge, Mass. $4.50.

THE CONTRACTOR'S LEGAL PROBLEMS—By Norris L. Hayward. 175 pp. McGraw-Hill Book Co., New York 18. $2.50.

SCIENTIFIC INSTRUMENTS—By Herbert J. Cooper. 305 pp. The Chemical Publishing Co., Brooklyn, N. Y. $6.00.

THE ENGINEER AT LAW—Two volumes. By C. B. and J. R. McCullough. 889 pp. total. Iowa State College Press, Inc., Ames, Iowa. $6.00.

MATERIALS-HANDLING EQUIPMENT—By Matthew W. Potts. 172 pp. Pittman Publishing Co., New York 19, N. Y. $2.50.

PRACTICAL DESIGN HANDBOOK FOR ENGINEERS — Enlarged edition. By Alois Cibulka. 61 pp. Clarke & Courts, Houston, Texas. $6.00.

Reports and Pamphlets

A ROMANCE OF STEEL IN CALIFORNIA—By Marshall Maslin. Limited edition, Judson Pacific-Murphy Corp., 1200 17th Street, San Francisco 10, Calif.

STUDIES OF SLAB AND BEAM HIGHWAY BRIDGES—Part I—Beam Bridges. Engineering Experiment Station Bulletin Series No. 363. University of Illinois, Urbana, Ill. $1.00.

GERMAN CONSTRUCTION METHODS—Joint Intelligence Objective Agency, Washington, D. C. British Intelligence Objectives Sub-Committee, London—H. M. Stationery Office. 8s. 6d.

STAMPELBELASTADE, Cirkulara Plattor pa Elastiskt Underlag—Swedish Cement and Concrete Research Institute, Stockholm.

AUTOMOBILE PARKING IN CENTRAL BUSINESS DISTRICTS—Technical Bulletin No. 6, Urban Land Institute, 1737 K St., Washington 6, D. C.

EVERY POLICEMAN A TRAFFIC OFFICER—By Joseph Kluchesky. 16 pp. The Eno Foundation for Highway Traffic Control, Saugatuck, Conn.

(*Continued on p.* 128)

A FREE ECONOMY IS WORTH FIGHTING FOR

BUSINESS must take the initiative if the price decontrol machinery, set up by Congress, is to be effective. The present price control law is far more than a set of instructions to the administrators of OPA; it is a challenge to business to be aggressive in speeding decontrol decisions and in persuading the Price Decontrol Board to adopt a strong stand for return to a free economy.

Thus far business has not met this challenge. *Two months after the passage of the new price law not a single application for decontrol of a major product had been filed by an industry advisory committee.* This is due in part to the red tape controlling such applications. Nonetheless, a continuation of such inactivity on the part of business can well result in perpetuating price control far beyond the time either the present law or sensible economic policy require.

It was the clear intent of Congress to hasten our return to a free economy. In the legislation continuing the general control of prices, Congress formally declared its purpose to have it "terminated as rapidly as possible."

To accomplish this, the House originally approved a formula which would have made decontrol mandatory when production had attained a prescribed level. The automatic decontrol provision was dropped before the bill was finally passed, partly because of the uncertain effects of strikes on production. But Congress did not mean to return the timing and extent of decontrol to the administrative discretion of OPA.

On the contrary, to assure having price control "terminated as rapidly as possible," Congress created a Price Decontrol Board and gave it power to overrule OPA when the board finds price control should be removed. Moreover, it gave to industry the right and the responsibility to seek decontrol. Also, in a further effort to speed up the decontrol process, it placed narrow limits on the time allowed for board decisions.

Congress had compelling economic reasons for doing its legislative best to speed up decontrol.

1. It is by all odds the best way to eliminate the bottlenecks in production and the black markets which have plagued the country since V-J Day.

Rigid price ceilings promote shortages of badly needed commodities by discouraging their production. Such shortages both upset the flow of production and promote black markets. At present a considerable part of American industry is stymied by shortage of critical parts and materials. Price control is much to blame.

2. There must be flexibility of prices if a round of new wage adjustments, which may be forced on industry early in 1947, is to be negotiated without grave risks of seriously curtailing production.

When, under the leadership of the national administration, the first post V-J Day round of wage adjustments was made, price ceilings were held rigid while wages were boosted. The result was a series of price-wage squeezes which upset production. They would have been disastrous if we had not been in a sellers' market, created by a tremendous accumulation of wartime shortages. In 1947, however, many industries will be in a buyers' market. It must be possible, therefore, to have wage increases reflected promptly in price adjustments if we are to avoid a repetition of the costly post V-J Day round of strikes, which often had price control as the key issue.

3. Rapid decontrol is necessary to maintain a high level of employment and production.

Almost five years of price control inevitably twisted the factors of production and distribution far out of the equilibrium which would prevail in a free economy to which it is the clear purpose of the nation to return. Unless the return to a free economy is facilitated by a speedy and orderly decontrol, the jolt of an abrupt return to competition can be expected to upset employment and production seriously.

It's Up To Business

To encourage speed and boldness in decontrol, Congress provided for the reimposition of control over any prices which, after being released, might get out of hand. The dangers of this sort are chronically exaggerated. During the 25-day period in July when there was no price control the Civilian Production Administration found that "manufacturers of finished industrial and consumer products have generally exhibited commendable restraint in increasing prices no more than increased costs."

All of this endeavor to speed up decontrol and expand its scope is likely to be futile, however, unless business furnishes the driving power for the machinery Congress provided. OPA certainly will not do it. Neither can the Decontrol Board be expected to go out and drum up cases.

The necessity for vigorous action by business in pressing for decontrol is increased by the fact that the general legislative standards to guide decisions by the Decontrol Board are vague. They must be clarified and sharpened by decisions in specific cases.

The main principle to guide the decontrol of non-agricultural products is that price ceilings shall be removed when supply is in approximate balance with demand. But what precisely does that mean? The meaning will become clear only through Decontrol Board decisions.

The same is true of the principle which makes automatic decontrol of a non-agricultural commodity contingent on whether or not it "is important to business costs or living costs." Business must press cases which will give specific meaning to those vague terms if decontrol is to get on apace.

Cards Are Stacked

At present the government has the cards pretty well stacked against rapid decontrol.

First, the key members of the staff of the Price Decontrol Board are holdovers from the Bowles regime which emphasized the importance of carrying on price control rather than speed in getting rid of it.

Second, in exercising his authority to prescribe regulations to govern petitions for decontrol, the OPA administrator has required excessively complicated statistical and economic data. Manufacturers who are sure they can convince any fair-minded board of the desirability of decontrolling certain of their products assert that they are blocked by statistical entanglements.

Third, OPA has discouraged business from moving immediately under one section of the law to speed decontrol. This section provides that products "not important in relation to business or living costs" may be freed from price ceilings immediately and must be freed by December 31, 1946, unles OPA specifically finds they are important to these costs. Instead of making it possible for business to move under this section now, OPA has issued rules which have the effect of blocking such a course until the end of the year.

In the light of obstacles such as these, it is not surprising that the record of decontrol to date is not impressive.

Decontrol Record

Since June 30 there has been a drop from about 70% to about 60% in the total value of products under price control. But most of the drop has been accounted for by food products, which Congress took the lead in decontrolling, and by industrial machinery which was being decontrolled when Congress acted. By far the larger part of manufactured consumer goods remains under control.

This, however, is no time for business to be discouraged. Rather, business should accept the obstacles put in its way as a challenge and work harder than ever for speedy decontrol.

The case for decontrol should not be stated in narrow technical terms. It should be based on grounds of broad public policy, and should demonstrate how a speedy return to a free economy can hasten the full release of the nation's productive power.

For example, there should be very clear demonstrations of how, in far too many cases, rigid price ceilings—(1) discourage production of key parts and materials by making such production relatively unprofitable, (2) create shortages of key parts and materials which tie up broad ranges of production or result in piling up lopsided inventories of partially completed goods, and (3) thus cut away the foundations of a stable economy and the prospects of steadily sustained employment.

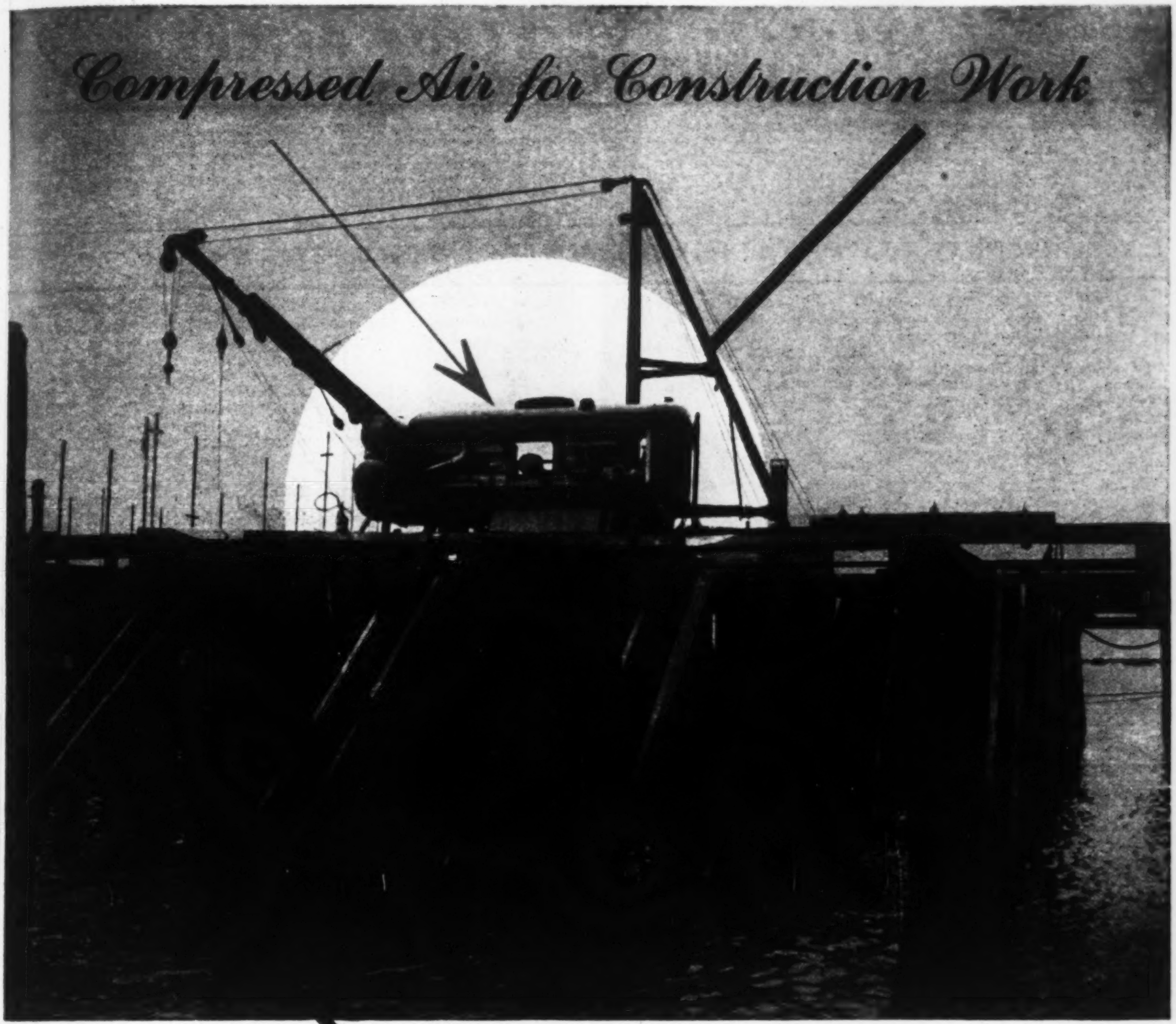
There should be equally full demonstrations of the well known sequence from shortages to unrealistic price ceilings to black markets. Meat prices are rolled back, but the meat is rolled under the counter.

A free economy is worth fighting for. Liberty is preserved only by the constant struggle of those who believe in it. Neither the interests of the nation in a strong and well-balanced economy nor the interests of business itself will be served by drifting at this time. Now is the time for business to lead a strong offensive for speedy elimination of price control.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

THIS IS THE 51ST OF A SERIES



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October, 1946

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

In October, prices remained relatively constant. Minneapolis reflected the greatest price changes. CEMENT in cloth bags rose $.60 per bbl. due to a refund of $.25 per bag returned in lieu of the previous $.10 per bag; READY-MIXED CONCRETE rose $.05 per cu. yd.; 8-in. VITRIFIED SEWER PIPE increased $.04 per ft., while 12-in. rose $.075 per ft. and 24-in. jumped $.295 per ft.; and 6x12 rough DOUGLAS FIR increased from $76.25 to a range of $76.25 to $84.25 while 12x12 Douglas Fir rose from $76.75 to a range of $76.75 to $84.75.

In Pittsburgh READY-MIXED CONCRETE rose $.20 per cu. yd. and LIME, pulverized masons, increased $.30 per ton. Pulverized masons in St. Louis rose only $.03 per ton. The price of common BRICK jumped $2.00 per M in San Francisco and $1.50 per M in Chicago. New York PORTLAND CEMENT prices increased $.10. Skilled and common labor WAGE RATES in all cities showed very little change this month.

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT Per bbl C/L lots incl 40c per bbl for bags, cash dis not deducted			SAND AND GRAVEL Per ton, carload lots			CRUSHED STONE Per ton, carload lots		CRUSHED SLAG Per ton, carload lots, f.o.b plant		CONCRETE BLOCK 8x8x16-in.; truckload del.; per block		CONCRETE Ready Mixed 1:2:4 over 50 c.y. del.
	Cloth	Paper	Bulk	Gravel 1½ in	Gravel ¾ in	Sand	1½ in	¾ in	1½ in	¾ in	Sand-grav	Lt.wgt.Agg	
Atlanta	$2.77	$2.52	$2.43	$1.79	$1.89	$1.65	$1.79	$1.89	$1.59	$1.69	$0.17	....	$9.00
Baltimore	2.70a	2.45a	2.20a	2.05‡	2.05‡	1.55‡	2.00‡	2.00‡	2.00‡	2.00‡	.145	$0.145w	8.00
Birmingham	2.70	2.45	....	2.00	2.00	1.59	2.50	2.50	.90	1.15	.1425	....	6.90
Boston	3.70bgg	2.85b	2.60	1.50‡	1.50‡	1.40‡	1.25	1.35	....	....	.13	.155w	7.90m
Chicago	3.56	2.71	2.52	2.23‡d	2.23‡d	2.23‡d	2.15‡d	2.15‡d	1.75‡	1.75‡	.195	.195x	....
Cincinnati	2.59	2.34	2.14	1.20	1.20	1.10	1.80	1.80	....	....	.15	.18w	7.45
Cleveland	3.28	2.43	2.18	1.75i	1.75i	1.40/2.05i	1.95i	1.95i	1.30	1.30	.14	.14	8.75
Dallas	2.51	2.26	2.06	1.80	1.80	1.45	1.72	1.82	....	....	.0875p	....	8.20
Denver	3.74	2.94	2.69	1.20	1.45	.90	1.65	1.75	....	....	....	.1625w	9.00
Detroit	3.23	2.38	2.18	2.65	2.65	2.35	2.25	2.25	2.00‡	2.00‡	.16	.17w	7.69
Kansas City	2.80	2.60	....	2.00	....	1.40	2.00	2.00	....	....	.16	.16wy	8.50n
Los Angeles	3.30r	2.70r	....	1.44	1.44	1.33	1.44f	1.44f	1.44f	1.44f	.19bb	.125bb	8.72m
Minneapolis	4.10dd‡hh	3.25dd‡	....	1.00h	1.00h	.25h	1.00h	1.00h	....	....	.183ff	....	7.65j
Montreal	....	1.95r	1.79r	1.65‡s	1.65‡s	1.50t	.80ct	.90ct	....	....	.1924	....	7.00ls
New Orleans	2.41	2.16	1.92	1.67	1.65	1.21	....	....	.90	1.15	.23	....	9.25
New York	4.16‡hh	3.16‡	....	1.74deu	1.74deu	1.07eee	1.80de	1.80de	....	....	.22	.18wcc	8.57kq
Philadelphia	2.75	2.50‡	2.30‡	1.55‡	1.65‡	1.20‡	1.90‡	1.95‡	1.25	1.25	.155	.155w	8.55
Pittsburgh	2.80	2.55	2.35	1.85‡	1.85‡	2.15‡	2.35‡	2.35‡	1.80	1.80	.21z	.21z	9.35
St. Louis	3.12o	2.89o	....	1.81‡o	1.81‡o	1.71/1.81‡o	1.25/1.95	1.25/1.95	.90g	1.15g	.155	.20yo	8.70
San Francisco	2.82	2.22	1.92	1.36	1.36	1.36	1.46	....	....	....	....	.23y	7.55
Seattle	....	2.75o	....	2.35d‡	2.35d‡	2.35d‡	2.85‡od	2.85‡od	....	....	.165	....	8.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* F.o.b. quarry. *d*. Per cu. yd. *e* Barge lots alongside docks *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash *k* Discount of 2 percent for cash in 10 days. *l* 2000 lb. concrete. *m* 50c. off for cash *n* 25 c.y or more. *o* 2% off for cash. *p* 5½ x 8 x 12 in. *q* 5 cu. yds. or more. *r* 20c. per bbl. off cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* In outlying New York districts, price is $1.89 *v* 20c. per bbl. discount; 80c. per bbl. for bags. *w* Cinder *x* Waylite. *y* Haydite *z* Celocrete. *aa* Pumice. *bb* 6 x 8 x 12 in. *cc* Also 8 x 18 in. *dd* Prices quoted are LCL Carload lots not available. *ee* In outlying New York districts, price is $1.22. *ff* 8 x 8 x 18 in. *gg* $1.00 per bbl. refund for return of bags. *hh* Refund of $.25. per bag returned.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount. 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICE BASES AT CEMENT MILL

Charge for bags not included. For cloth bags, add $1.05c. per bbl.; 25c. refund allowed for each returnable bag; for paper bags add 20c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind.	$1.90	$1.85	Ironton, Ohio	$1.80*	$1.75*	Universal, Pa.	$1.85	$1.90
Hannibal, Mo.	1.90	1.85	Northampton, Pa	1.75	1.70	Waco, Tex. (Plus 9c. tax in Tex.)	1.75	1.80
Independence, Kans.	1.90	1.85	Richard City, Tenn	2.05	1.95	Montreal City (Discount 10c per bbl 20 days)	1.68	1.67
			Steelton, Minn	2.00	1.95			

*Destination price base effective Sept 17, 1945

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT Per ton, less than 80 penetration		ASPHALT BINDERS—FLUXES Per gal., 80–300 penetration		CUTBACK ASPHALT Per ton		ROAD OIL Per gal	ASPHALT EMULSION (Quick-breaking) Per gal	
	Granite per M lots of 50,000 4x4x8 in	Brick per M 3x4x8½ in carload lots	Wood per sq. yd. 3½ in 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$35.00	$2.25	$14.00	.....	$0.071	.....	$0.0806h	.....	$0.0781	$0.0806	.....
Baltimore	150.00‡	52.70	85.00m	15.00r	21.00r	.06r	0.09r	13.00r	23.00r	.06r	.07r	.14r
Birmingham	.....	32.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston	85.00	59.00	3.75	16.00	25.00	.0675	.12	18.00	31.00	.0675	.0875	.15
Chicago	150.00‡	65.00/68.00e‡	2.85/4.00d	15.00 16.00	23.50	14.15 15.00g	22.65g	.0625/.0675h	.155/.16h	.05/.0575	.09/.10‡	.13/.15‡
Cincinnati	125.00	66.90	.....	17.00	.....	.085	.....	19.20	.....	.07	.085	.....
Cleveland	127.50	39.00	3.87	17.00	19.00	.085	.085	.10h	.11	.08	.....	.....
Dallas	.....	40.00	.....	15.36	22.70	.0618	.12	17.95	28.00	.06	.0725	.135
Denver	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	75.00t	.....	17.60j	26.56f	.0734	.128	.0718h	.119h	.067	.0974	.135
Kansas City	.....	45.00	.....	15.00u	20.60u	16.60g	.....	.07h	.0675hu	.....	.11	.15u
Los Angeles	.....	50.00	.....	9.00b	23.00b	9.50bg	24.00bg	9.50bg	.....	.03b	.08b	.16b
Minneapolis	.....	.....	2.017d	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montreal	70.00	.....	.....	16.60k	24.25k	.1035k	.111k	.115hk	.135hk	.08k	.135k	.188k
New Orleans	.....	.....	.....	13.00a	.....s	12.00g	.....s	5.75	.....s	.05	.....	.....
New York	.....	.....	2.70n	18.64	28.49s	.0735t	29.44g	.0751h	.1256h	.0678	.0768	.1278
Philadelphia	150.00	62.00	4.06	16.00	.....	15.00	.....	.0675h	.....	.....	14.00gr	.....
Pittsburgh	135.00	39.75	3.90	19.00	25.00	.095	.17	21.00	32.00	.075	.085	.14
St. Louis	.....	42.00	.....	14.80	19.80	13.80g	18.80g	.0587h	.1362h	.483	.07	.1215
San Francisco	.....	47.75c	.....	11.75	21.00	11.75g	.....	13.75	.....	...	.0525	.1125
Seattle	.....	.....	.....	11.75i	22.75i	9.50	.....	11.75i	14.75	10.90i	.0525i	.0625i

‡ Delivered *a* F.o.b. Baton Rouge *b* F.o.b. Refinery. *c* 2¾ x 8¼ x 4 in *d* 2-in interior block, 6-lb. treatment *e* 3½ x 4 x 8½. *f* Mexican. *g* Per ton. *h* Per gallon *i* F.o.b. Martinez. *j* 3 x 3¾ x 8½ in *k* Tax included. *l* Quoted on request only *m* Per thousand *n* 2 in., treatment 6 lb. *r* February 1943 prices, none later available *s* Drums not available. *t* Very scarce. Truck deliveries in small quantities

October, 1946

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ½-in. billet *b*	RIVETS ¾-in. structural	WIRE NAILS Base	SHEET PILING Base	STEEL RAILS Per Net Ton Standard	Light	Re-rolled	TRACK SUPPLIES Angle Bars	Std Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.35	$2.35	$4.75	$3.75	....	$43.39	$49.18	Not	$2.85	$3.65	$2.55	$6.50
Chicago	2.35	2.35	4.75	3.75	$2.65	43.39	49.18	avail-	2.85	3.65	2.55	6.50
Pittsburgh	2.35	2.35	4.75	3.75	2.65	43.39	49.18	able	2.85	3.65	2.55	6.50
Buffalo	2.35	2.35	....	....	2.65	.....	.....	.....	....	....	2.55	....
Cleveland	....	2.35	4.75	3.75	....	.....	.....	.....	....	....	....	....
Youngstown	....	2.35	....	....	....	.....	.....	.....	....	3.65	....	....
Detroit	....	2.45‡	....	....	....	.....	.....	.....	....	....	....	....
Gulf ports	2.70*a*	2.70*a*	....	....	2.85*a*	.....	.....	.....	....	....	....	....
Pacific ports	3.00*a*	2.75*a*	....	4.25*a*	3.20*a*	.....	.....	.....	....	3.90	2.70	....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone. Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va *d* Add switching charge $18 per cl.

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS*g* Per 100 lb., ½ in., base price 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq. ft., carload lots 4x16 in., No 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per 100 s. f.	SHEET PILING Per 100 lb. base price
Atlanta	$4.05‡	$4.12‡	$4.12‡	$.025	$.10	$23.16	$25.30	$1.95	$1.45	$2.05	$3.35
Baltimore	3.909	3.344	....	....	.10	24.50	26.50	1.83	1.37	1.93	3.25
Birmingham	....	....	....	....	.10	19.00	21.00	1.93	1.44	2.03	....
Boston	4.162‡	4.194‡	2.97*c*	$20 C.L.	.10	18.50	20.50	1.89	1.41	1.98	3.02
Chicago	2.35*a*	2.35*a*	2.35*a*	.03	.05	22.50‡	24.50	1.80	1.35	1.89	2.65
Cincinnati	3.983	2.90*cd*	2.90*cd*	....	.10	....*n*	....*n*	1.80	1.36	1.89	....
Cleveand	3.838	4.00	3.98	.025	.10	20.50	24.50	1.79	1.35	1.88	....
Dallais	5.25	4.17	4.17	....	....	25.50	27.50	2.06	1.52	2.17	....
Denver	4.89	5.02	....	....	....	37.00	41.00	2.10	1.55	2.21	....
Detroit	3.952‡	3.14‡	3.14‡	....	.10	38.00‡	41.00‡	1.81	1.36	1.90	2.95
Kansas City	4.44	2.75*cd*	2.75*cd*	.0	.05	29.50	31.50	1.91	1.43	2.01	3.062
Los Angeles	4.45*f*	3.025	2.875	.03	.05	23.00	27.50	2.06	1.52	2.17	4.45
Minneapolis	4.142‡	2.99	2.99	.0	.10	25.00	27.00	1.93	1.44	2.03	3.06*d*
Montreal	3.95*i*	3.10*i*	3.00*i*	....	....	31.00*hi*	46.00*hi*	2.89	3.54*i*	2.96*im*	....
New Orleans	4.408‡	3.84	4.108	.05	.10	22.00	24.00	1.95	1.45	2.05	3.125
New York	4.008	2.96*c*	2.96*c*	....	.15	17.50	19.50	1.85	1.39	1.95	2.74
Philadelphia	3.937	3.899	....	....	....	20.50‡	22.50‡	1.84	1.38	1.93	2.97
Pittsburgh	2.35*a*	2.35*a*	2.35*a*	.025	.10	23.00	26.50	1.72	1.30	1.81	2.65
St Louis	3.401	2.96	2.96	.0	.05	28.00	34.00	1.82	1.37	1.92	....
San Francisco	4.40	3.025	2.875	.025	.10	28.00	31.50	2.06	1.52	2.17	3.30
Seattle	3.00*e*	3.00*e*	....	....	....	43.50	44.00	2.06	1.52	2.17	3.20*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight.. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *m* Per sq. yd. *n* Practically no carloads are available. Retail price delivered is $27.00 for std. diamond mesh and $29.00 for std. ribbed.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

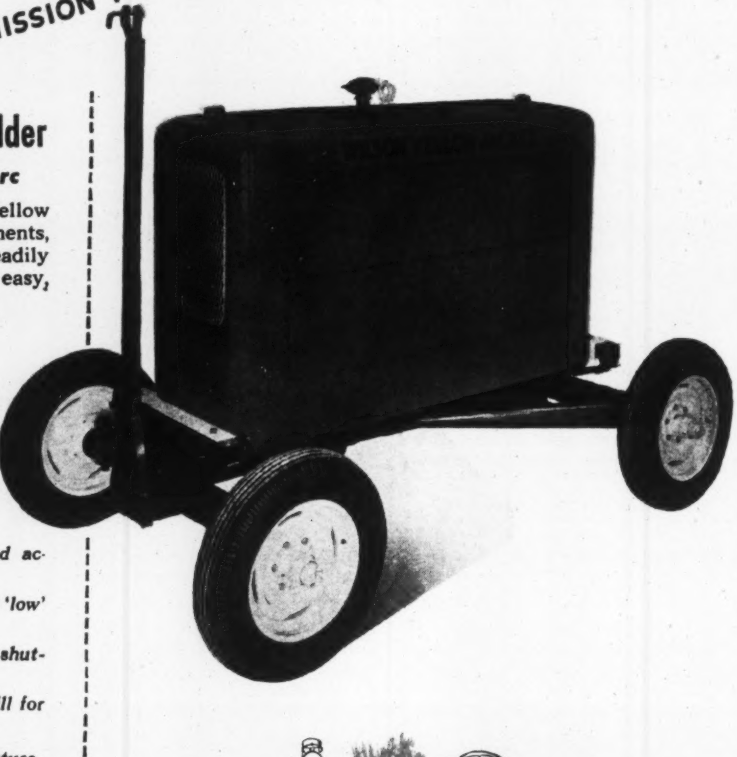
	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*i*	VITRIFIED SEWER PIPE Per foot, std. 8 in. s.s.	Delivered std. 12 in. s.s.	ASTM 24 in.	C13–35 36 in.	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h* 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6 in., Lap Weld Black %	Galv. %
Atlanta	$65.66	$0.43	$0.67	$3.39	....	$110.00	$140.00	$0.45	$2.00	65.5	54.5	63.5	53.0
Baltimore	70.20	.35	.60	2.70	$7.25	160.00	200.00	.85	2.25	65.5	57.5	63.0	54.5
Birmingham	61.00	.35	.63	2.736	....	100.00	220.00	.57	1.80	....	....	....	....
Boston	72.80	.392*r*	.756*r*	3.15*r*	7.995*r*	170.00‡*r*	265.00‡*r*	.53	2.04	....	....	....	....
Chicago	70.33	.44	.85	3.37	7.00	110.00‡	150.00‡	.45	1.85	63.0	52.0	61.5	50.0
Cincinnati	69.27	.327	.6345	3.735	10.04	98.70	151.60	.36	1.60	51.5	39.4	51.4	36.0
Cleveland	70.75	.226*r*	.513	2.15	5.535	138.50	216.60	.36	1.60	68.5	57.5	66.0	54.5
Dallas	72.43	.365	.657	2.664	6.00	108.00	130.00	.46	1.75	65.5	54.5	63.0	51.5
Denver	77.56	.36	.648	2.70	....	154.00‡	264.00‡	.52	2.00	44.0*s*	30.25*s*	40.5′	25.25′
Detroit	70.75	.455	8.775	3.375	8.50	170.00‡*r*	263.00‡*r*	.40	1.75	54.1	40.3	50.9	36.5
Kansas City	71.73	.345	.625	2.47	6.85	173.00	312.00	.45	1.60	60.5	49.5	57.8	46.3
Los Angeles	84.40	.36†	.648†	2.988	7.47	130.50	217.50	1.25	2.50	....	....	....	....
Minneapolis	73.83	.40†*z*	.825†*z*	2.94†*z*	....	......	......	.90	2.40	60.6	49.6	57.9	46.4
Montreal	74.20	.85*o*	1.50*o*	5.25*p*	8.50*ep*	45.00*m*	64.00*m*	.811*m*	2.51*m*	....	....	....	....
New Orleans	67.78	.31	.558	3.558	....	112.00	......	....	....	58.8	47.8	56.3	44.8
New York	69.60	.52	.96	3.82	9.18	......	......	.60	1.40	65.5	54.5	69.0	51.5
Philadelphia	68.10	.40	.7735	3.20	8.50	200.00	275.00	.80	2.15	52.24	38.49	49.12	34.74
Pittsburgh	71.18	.322†*r*	.631†*r*	2.70†*r*	6.625*r*	124.20	193.80	.99	2.25*g*	65.5*i*	54.5*i*	63.0*i*	51.5*i*
St. Louis	68.84	.351*w*	.632*w*	2.527*w*	5.60*w*	......	......	1.00*j*	2.15*k*	64.5*s*	53.5*s*	63.0′	51.5′
San Francisco	84.40	.3875*d*	.6975*d*	2.79	6.975	124.50	207.50	.58	2.34	....	....	....	....
Seattle	86.20	.4125	.77	2.98	....	......	......	.56*f*	1.60*f*	....	....	....	....

‡ Delivered † F.o.b. *a* B. & S. class B and heavier, C/L lots, Burlington, N. J. (base) $59.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $3 per ton additional. 4 in., $5 per ton additional, 30 in. and larger usually $1 per ton less. *b* Double strength. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ½ in., 8½c.; ¾ in., 11½c. 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92; 3 per cent tax on transportation costs not included. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base. Butt-weld—1 in. and 1¼ in. black 34 galv. 16; 1½ in. black 38 galv. 18½ 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½ galv. 14½; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76–37. *k* Reinforced: spec. C 75–37. *m* Centri spun *o* Less 50%. *p* Less 53%. *r* Truck delivery. *s* Gary base. ′ Morain base *w* Less 3% for cash. *z* Since carload lots are not available at this time, listed price is based on LCL (no minimum).

"TOPS"

for general purpose field welding

TRANSMISSION PIPE LINES . . . STEEL CONSTRUCTION



The Wilson "Yellow Jacket" Arc Welder

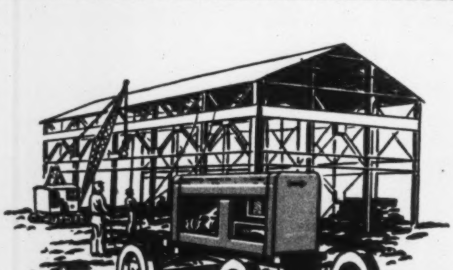
Famous For Its Penetrating Stinging Arc

The self-contained, gasoline engine-driven "Yellow Jacket" is built to meet severe welding requirements, inside or out, where electric current is not readily available. It is known for its fast response . . . easy, accurate control . . . close-coupling between engine and generator . . . and trouble-free, reliable performance.

In every respect — output, operation, convenience and maintenance—the "Yellow Jacket" meets the exacting requirements of pipe line welding, construction and similar field work. Here are a few more reasons why:

1. *New, improved idling device acts instantly — needs no maintenance.*
2. *Convenient handwheel provides easy, and accurate current control.*
3. *Wide current range divided into 'high' and 'low' by a Selector Switch.*
4. *Over-size gas tank eliminates frequent shutdowns for refueling.*
5. *Industrial type radiator with protecting grill for ample cooling of engine.*
6. *Sturdy, weatherproof case, finished in moisture-proof enamel, completely shields internal parts against entrance of rain, sleet, etc.*

The "Yellow Jacket" is made in 200, 300, and 400 ampere sizes, and is supplied as a stationary unit or in portable types. A descriptive bulletin, ADW-19B, will be supplied on request, write: Air Reduction, General Offices, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices, Houston 1, Texas. Represented Internationally by Airco Export Corporation.



AIRCO

AIR REDUCTION

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene, and other Gases . . . Carbide . . . Gas Welding and Cutting Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories.

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face)
All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)

LONG LEAF Y. P: Merchantable grade up to 20 ft.
PLYWOOD: Rail freight increment (See note for base price)

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR									LONG LEAF Y. P		PLYWOOD	
	1x6 s4s	1x8 s4s	2x4 s4s	2x6 s4s	2x8 s4s	2x10 s4s	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	5/8"	3/4"
Atlanta	**$48.25**	**$48.25**	**$46.75**	**$46.25**	**$47.25**	**$49.75**	.....	.....	.....	$71.00	$71.00	$17.72	$21.37
	62.50	*62.50*	*61.00*	*61.00*	*60.00*	*60.00*	*$54.00*	*$53.50*	*$52.50*	.....	.....	......	....
Baltimore	**72.50**	**74.00**	**69.50**	**69.00**	**69.00**	**75.00**	**85.00**	.....	.....	181.00	175.00	18.45	21.995
	79.00	*80.00*	*78.50*	*72.00*	*77.00*	*78.00*	*92.00*	*85.00*	*83.00*	.....	.....	......	....
Birmingham	**50.00**	**50.00**	**49.50**	**48.50**	**49.50**	**52.50**	**73.00**	.....	.....	72.50	75.00	17.245	20.795
1	*55.00*	*55.00*	*54.50*	*53.50*	*54.50*	*57.50*	*77.00*	*60.00*	*61.00*	.....	.....	......	......
Boston	70.00[3]	72.00[3]	66.50[3]	62.50[3]	70.50[3]	74.50[3]	70.25[3]	.....	.....	.....	.....	18.195	21.995
	64.75	*64.75*	*62.75*	*63.25*	*62.75*	*62.75*	*60.50*	*59.50*	*59.50*	*59.50*	.....	......	....
Chicago ‡	**65.00**	**66.00**	**62.00**	**62.00**	**62.00**	**69.00**	**75.00**	.....	.....	97.00	97.00	14.555	17.555
	65.50	*65.50*	*65.50*	*65.50*	*65.50*	*66.50*	*67.50*	*63.00*	*64.00*	...	.....	......	..
Cincinnati	**51.00**	**52.50**	**46.00**	**46.00**	**48.00**	**56.00**	**70.50**	.....	.....	68.50	68.50	17.245	20.795
Cleveland	**58.50**	**58.50**	**56.50**	**55.50**	**56.25**	**58.25**	**65.00**	.....	.....	.....	91.75	17.615	21.265
	64.50	*64.50*	*58.50*	*54.50*	*54.50*	*55.75*	*63.75*	*58.75*	*57.75*	.....	.....	......	....
Dallas	**54.50**	**54.50**	**52.75**	**51.75*j***	**52.25**	**54.00**	**56.50**	**59.50**	**59.50**	89.75	86.00	14.555	17.555
Denver	*77.25*	*77.25*	*73.50*	*73.50*	*72.50*	*73.50*	*74.50*	*76.00*	*76.00*	.....	.....	10.285	12.435
Detroit	**82.00**	**82.00**	**79.00**	**79.00**	**79.00**	**85.00**	**92.00**	.....	.....	91.00	105.00	17.245	20.795
	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....	.....	......	......
Kansas City *a*	**76.00**	**76.00**	**74.00**	**72.75**	**73.25**	**76.00**	**95.00**	.....	.....	95.00	100.00	12.605	15.205
	78.00	*78.00*	*77.50*	*77.50*	*75.50*	*77.00*	*75.00*	*95.00*	*95.00*	.....	.....	......	....
Los Angeles *a*	*74.00*	*74.00*	*74.00*	*74.00*	*74.00*	*74.00*	*80.00*	*79.50*	*79.00*	.....	.....	9.81*gh*	11.86*gh*
Minneapolis ‡*b*	84.00[6]	82.50[6]	.....	.....	.....	.....	.....	.....	.....	.....	.....	13.765	16.615
‡	*85.00*	*85.00*	*79.75*	*80.00*	*78.75*	*80.25*	*74.50*	*76.25/84.25*	*76.75/84.75*	.....	.....	......	....
Montreal *e*[7]	69.00	70.00	64.00	68.00	70.00	75.00	.....	.....	.....	.20*i*	.20*i*	......	......
	97.00	*97.00*	*97.00*	*97.00*	*97.00*	*97.00*	*87.00*	*87.00*	*87.00*	.....	.....	......	......
New Orleans	**42.00**	**42.00**	**39.00**	**38.50**	**34.00**	**42.00**	**46.00**	.....	.....	54.50	69.00	14.555	17.555
	36.00	*36.00*	*34.50*	*34.50*	*33.50*	*33.50*	*33.00*	*29.50*	*29.50*	.....	.....	......	....
New York ‡	**Range from $85.00 to $95.00**						**$95 to $100**	.....	.....	125.00*f*	130.00*f*	18.195	21.995
‡	*Range from $91 to $121*									.....	.....	......	....
Philadelphia	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	.....	.....	140.00	140.00	18.195	21.995
	90.00	*90.50*	*90.00*	*90.00*	*90.00*	*90.00*	*90.00*	*100.00*	*100.00*	.....	.....	......	....
Pittsburgh	**55.40**	**57.80**	**67.35**	**59.60**	**65.45**	**67.10**	**80.85**	.....	.....	126.00	137.00	17.88	21.63
	73.60	*72.70*	*70.70*	*69.90*	*69.80*	*70.35*	*87.35*	*92.85*	*92.85*	.....	.....	......	....
St. Louis	**71.50**	**71.50**	**70.50**	**69.25**	**70.00**	**72.50**	**82.75**	*83.25*	*82.00*	107.00	104.25	14.555	17.555
San Francisco *d*	*66.00*	*66.00*	*62.25*	*62.25*	*61.25*	*61.25*	*56.00*	*55.00*	*55.00*	.....	....	7.33*g*	8.83*g*
Seattle	*50.00a*	*50.00a*	*52.25a*	*52.25a*	*51.00a*	*51.00a*	*50.75a*	*52.75a*	*57.75a*	.....	.....	......	......

Bold Face type. Southern Pine. *Italics, Douglas Fir.* [1] Long leaf [2] Roofers N C Pine. [3] Spruce. [4] Native. [6] Western Pine, No. 3 Common [7] Spruce [8] Norway Pine. ‡ Delivered. *a* Yard prices. *c* 5M ft. or less. *d* Sales through wholesale distribution yard (F.o.b purchaser's truck or carrier San Francisco paid). *e* Plus sales tax *f* Up to 18 ft. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* FBM, scarce, no stable quotation, no ceiling. *j* No fir available in the city at this time.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on 5/8", $95.15: on 3/4", $104.85: price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS		EXPLOSIVES
	Discounts from jobbers list. Aug. 15, 1938 Single or Double Thickness		Per lb. 40% Ammonia Gelatin in 50 lb. cases delivered in 200 lb lots*
	A quality	B quality	
Atlanta	74%	75%	$0.18
Baltimore	78%	79%	.18
Birmingham	76%	76%	.135
Boston	77%	78%	.18
Chicago	73%	73%	.18
Cincinnati	77–10%	77–10%	.18
Cleveland	77%	77%	.22
Dallas	76%	76%	.1925
Denver	76%	76%	.185
Detroit	77%	77%	.18
Kansas City	77–10%	77–10%	.18
Los Angeles	86%*d*	88%*d*	.1875
Minneapolis	77%	77%	.185
Montreal	40–10–2%*ab*	50–2%*ac*	.1975
New Orleans	70%	75%	.19
New York	80–18%*g*	81–18%*g*	.25*f*
Philadelphia	74%	75%	.18
Pittsburgh	77%	77%	.1525
St. Louis	77–10%	77–10%	.185
San Francisco	66%	73%	.185
Seattle	75%	75%	.1875

Price of 60% Ammonia Gelatin is $0.01 per lb. higher than 40%

a Discount from list Sept. 1939: sales tax included, but 6% tax exemption not allowed for. *b* Single thickness. *c* Double thickness. *d* Discount from jobbers list Sept 15, 1928. *f* In borough of Kings, Queens and Richmond, and in Manhattan south of Canal St., add delivery charge of $6.00 per trip. *g* Discount from jobbers list Jan. 16, 1946

* Urban prices influenced by service charges or local storage and delivery regulations do not consistently reflect quantity prices in less congested areas.

40% Ammonia Gelatin price ranges in other than urban areas, per lb.
(except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E of the Miss., except Fla. and Me.	$0.135	$0.16	$0.18
W. of Miss. to Rocky Mtn. States. Fla. and Maine.	.14 –.1475	.165 –.1775	.185 –.1975
Rocky Mtn. States	.14 –.1525	.165 –.1825	.185 –.2025
Pacific N W States	.1375–.15	.1675–.18	.1875–.20
Pacific S W States	.1350–.1425	.165 –.1725	.185 –.1925

PILES, TIES F.O.B.

PILES

Prices per linear foot, fir and pine, bark on. f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

Dimensions	Points	Length	By Rail Pine*	By Rail Fir
12 in. at butt	6 in.	30 to 50 ft.	$0.34	....
12-in.— 2 ft. from butt	6-in.	50 to 59-ft.	.35	....
12-in.— 2 ft from butt	6-in.	60 to 69-ft.	.36	....
12-in.— 2 ft from butt	6-in	90 to 100-ft.	....	.56
13-in.— 3-ft. from butt	5-in.	91 to 100-ft.	....	.58
14-in.— 2-ft. from butt	6-in.	50 to 69-ft.	.41	.65
14-in.— 2-ft from butt	6-in.	70 to 79-ft.	.43	.59
14-in.— 2-ft from butt	5-in.	80 to 85-ft.	.54	....
14-in.— 2-ft from butt	5-in.	85 to 89-ft.	.57	....
14-in.— 2-ft from butt	5-in.	90 to 100-ft.	....	.64

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

Prices f.o.b. per tie for carload lots:		6"x8"x8'		7"x9"x8'6"	
		Untr.	Tr.	Untr.	Tr
Boston	Oak	$1.50	.....	$2.00	...
	Pine	2.00	$3.00*a*	2.50	$3.00*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	Hardwood	1.00	1.60*a*	.....	2.25*a*
Chicago	Red Oak	.....	2.45/2.65*a*	.....	3.35/3.60
Los Angeles	Douglas Fir	2.10	3.35*a*	3.00	4.80*a*
Philadelphia	Red Oak	....	2.10*ag*	.....	3.25*ag*
St. Louis	White Oak	1.80	.....	2.40	....
	Red Oak	1.73	2.25*a*	2.19	3.25*a*
	Sap Pine or Cypress	1.80	.....	2.06	.....
San Francisco	Douglas Fir	1.25*bet*	.....	.....	3.00*caf*
Montreal	Birch or Maple	.....	1.65	1.04	...

Tr.— Treated; Untr.— Untreated *a* Creosoted *b* 6"x8"x8'6" *c* Empty cell. *d* Zinc. *e* Green. *f* F.o.b. cars. † Out of market. *g* January 1943 price, none later available.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder in drums f.o.b. works, per 100-lb	$2.50– 3.10
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77–80%, flaked, 100-lb. paper bag, del'd. ton	18.50–35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags	1.15–1.20
Sulphate of copper, in bbl., per 100-lb	5.00

Down-to-Earth Engineering

GAR WOOD Cable Controls Featur
Rugged Simplicity and Direct Action P

Cable Dozecaster

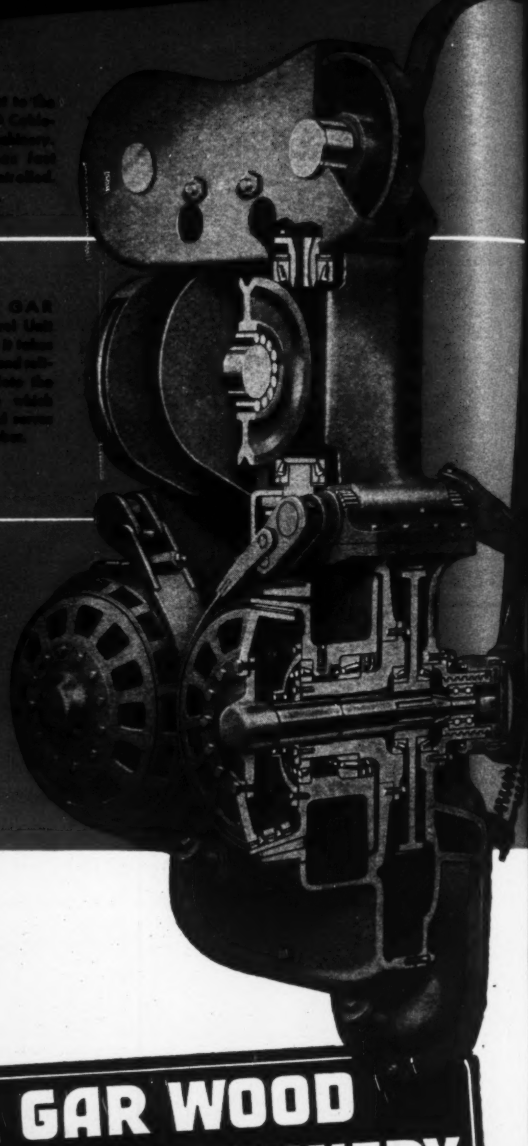
Heavy-Duty Cable Ripper

Scraper

The cable goes direct to the job in GAR WOOD Cable-Controlled Road Machinery. As a result, it has fast action, positively controlled.

The Job-proved GAR WOOD Cable Control Unit (right) has everything it takes for smooth operation and reliable performance. Note the sturdy steel housing which prevents distortion and serves as a lubrication chamber.

Outside clutches and servo-type, self-energizing brakes cool themselves and are readily accessible. Roller bearings throughout and spur-type gears keep adjustments at a minimum.



PROVED through the years on the toughest of jobs. Made more rugged than ever by the lessons learned in war action on every front, from Guadalcanal to Okinawa and from Oran to Berlin.

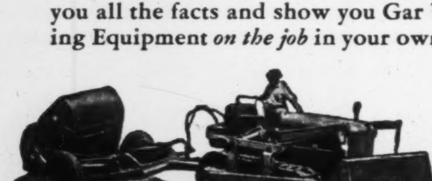
GAR WOOD Road Machinery and the famous GAR WOOD Cable Control Power Unit offers practical design and sound construction, well engineered and honestly built—equipment that *holds together* and can be operated with an absolute minimum of down time. *If it's* GAR WOOD, *it's good.*

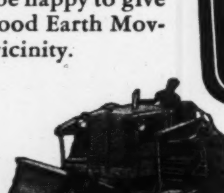
See your Allis-Chalmers dealer. He'll be happy to give you all the facts and show you Gar Wood Earth Moving Equipment *on the job* in your own vicinity.

GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER

Sold Through
ALLIS-CHALMERS
Dealers Everywhere

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, INC
DETROIT 11, MICHIGAN


Gar Wood 2-Wheel Hydraulic Scraper and Bulldozer


Gar Wood Hydraulic Dozecaster

OTHER GAR WOOD PRODUCTS: HOISTS AND BODIES • TANKS • WINCHES AND CRANES • HEATING EQUIPMENT • MOTOR BOATS

October, 1946

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M. lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M lots of 2,000 pieces or over,			BRICK Per M. in quantity.		LIME		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Per ton. Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized, or lump
Atlanta	$110.00	$130.00	$230.00	$240.00	$270.00	$300.00	$24.00	$24.00	$19.00	$17.50	$17.50
Baltimore	90.00	95.00	175.00	200.00	260.00	300.00	23.75*k*	29.75*k*	20.00	15.00	2.50*m*
Birmingham	91.00	96.00	133.00*c*	216.00	......	......	18.50	21.00	19.11	15.05	16.05
Boston	105.00†	112.00†	210.10†	252.09†	......	......	20.00*i*	20.00*i*	21.00†	.....	16.00
Chicago	92.10	98.40	185.20	......*x*	......*x*	......*x*	18.50	19.50	18.00	16.00	.....
Cincinnati	75.39	80.39	150.90	170.91	242.35	277.25	33.00	33.00	16.90	14.40	.....
Cleveland	98.10	104.55	......*x*	196.00	......	......	24.00	24.00	17.05	14.55	19.55
Dallas	77.25	83.00	165.00	198.00	254.50	315.00	17.25	19.00	19.00	15.00	15.00
Denver	105.25	119.00	198.25	230.00	263.50	315.25	26.50	28.00	30.00*j*	28.00*f*	26.00
Detroit	92.70	96.70	174.50	198.80	257.20	294.30	24.00*f*	24.00*f*	22.00	20.00	20.00
Kansas City	......	......	......	......	......	.....	17.50	18.50	30.40	24.00	24.00
Los Angeles	82.50†*r*	97.50†*r*	135.00*c*†*r*	210.00†*r*	368.00†*r*	460.00†*r*	16.50	18.50	16.50	17.50	17.50
Minneapolis	......	112.00*b*	186.25*b*	112.00*aa*	......	......	18.50*v*	.....*g*	26.00*bb*	21.00*bb*	24.00*bb*
Montreal	92.50*a*	98.50*a*	196.25*a*	151.50*a*	......	294.40*a*	22.16†*u*	29.41†*u*	12.50*u*	14.00*u*	8.00*u*
New Orleans	104.50	109.55	207.25	222.25	326.90	385.65	17.75	.....	18.30	12.08	14.10
New York	103.90	110.80	152.35	164.20*hn*	......*x*	......*x*	25.50	.....	22.00	16.00/17.00	19.00/20.00
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	24.75	27.75	22.00	18.00	17.00
Pittsburgh	98.50	105.90	181.95	217.30	265.85	303.10	23.25	25.25*y*	19.40*cc*	16.90*cc*	2.85*m*
St. Louis	......	......	......	......	......	......	26.00*s*	25.00*s*	21.00*s*	20.00*s*	...68*s*
San Francisco	102.40	115.20	153.60	115.20*t*	......	......	23.00	.....	19.90	19.90	1.99*m*
Seattle	129.25	141.50	......*x*	141.50*cc*	......	......	23.00*k*	28.00*k*	20.00*s*	20.00*s*	3.00*m*

* F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6 x 12 x 12 in. *f* Includes $3.50 per M. for delivery. *g* No quotation. *h* F.o.b Perth Amboy, N. J. *i* F.o.b. Warehouse only. *j* OPA Price. *k* $1.00 discount. *m* Per bbl., 180 lb. *n* 7¾ x 7¾ x 12. Speed tile. *o* Per bbl., 200 lb. *r* 5% discount 10 days. *s* 2% discount for cash. *t* 5½ x 8 x 11½. *u* 8% sales tax included. *v* sand lime. *x* Not available. *y* Stacked. *s* Pebble lime, price per 80 lb. sack. *aa* 5 x 8 x 12 in. *bb* LCL, delivered. *cc* Truck delivery.

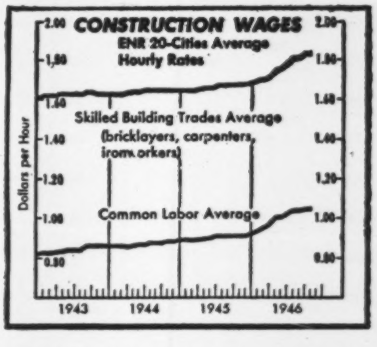
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl.	WHITE LEAD	READY-MIXED PAINT Per gal., drums			ROOFING SUPPLIES Carload lots f.o.b. factory				
	Dry *a*	Per 100 lb. in oil	Graphite *b*	Aluminum *c*	Ferric Oxide *d*	Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 360 lb. bbl. per ton
Atlanta	$12.00	$15.625	$1.75	$2.70	$1.65	$2.06	$2.06	$2.06	$1.00	$36.00
Baltimore	11.75	15.25	2.00	3.00	2.50	2.35	2.90	2.90	.40	29.00
Birmingham	12.00	15.625	2.35	3.70	2.08	2.28	2.20	2.20	.32	28.70
Boston	11.75	15.25	1.75	2.50	2.31	2.00‡*h*	3.30‡*u*"	3.30‡*u*"	.25‡	21.00‡
Chicago	11.75	15.25	....	....	....	1.75*hf*	1.99*hf*	1.99*hf*	.33*f*	23.00*f*
Cincinnati	11.75	15.25	1.70	2.90	1.60	2.20	2.10*h*	2.10*h*	.33	25.00
Cleveland	11.75	15.25	....	....	....	1.71	1.63*h*	1.61*h*	.237	25.00
Dallas	11.75	16.00	1.88	2.95	.06*l*	1.89*h*	2.00*h*	2.00*h*	.65	37.00*w*
Denver	11.75	15.75	1.65	3.45	2.25	2.53	2.36*h*	2.36*h*	.29	29.00
Detroit	11.75	15.25	1.75	3.00	1.60	2.25	2.25	2.25	.50	23.00
Kansas City	11.75	15.375	2.30*g*	2.55*g*	2.16*g*	2.50	2.75	2.75	.52	.....
Los Angeles	12.00	15.75	2.00	2.60	2.50	2.10	1.50	....	.45	.....
Minneapolis	11.75	15.375	....	....	....	1.90*i*	1.85*hi*	1.85*hi*	.32	23.00
Montreal	.....	.....	2.50*p*	4.90*p*	3.15*p*	2.71	2.45*t*	2.45*t*	.84	1.83*k*
New York	11.75	15.25	2.03	....	1.82	1.9006	1.8468*o*	1.8468*o*	.26	23.00
Philadelphia	11.75	15.25	1.60/1.80	2.20	1.55	2.30	2.81	2.81	.32	23.00
Pittsburgh	11.75	15.25	1.95	2.40	1.75	2.15	2.09*h*	2.09*h*	.34	27.00
St. Louis	11.75	15.25	2.28*s*	2.89*s*	1.96*s*	2.01*h*	2.01*h*	2.01*h*	.46	28.00
San Francisco	12.00	15.50	1.80	2.75*n*	1.35	1.7613	4.72	2.472	.3399	21.115
Seattle	12.00	15.75	1.90	3.00	....	2.15	2.16*h*	....	.35	31.00*j*

‡ Delivered. Note: Red lead in oil 50c higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *f* Distributors' price to contractors. *g* 55 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *l* Per lb. *n* May, 1941 price. *o* 60-lb. roll. *p* Plus 8% sales tax. *s* December, 1942 price. " Federal tax included. *u* 90-lb. roll. *v* Truck delivery. *w* Price previously misquoted—should have been listed as $37.00.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$2.00	$1.50	$1.625	$1.50	$1.62	$0.75	$0.80
Baltimore	1.90	1.775	1.90	1.625/2.00	1.725	.95	.95
Birmingham	1.9375	1.50	1.625	1.50	1.65	.65	.65
Boston	1.725	1.60	1.85	1.65	1.667	1.15	1.15
Chicago	2.00	1.95	1.95	1.95	2.00	1.30	1.30
Cincinnati	1.875	1.65	1.775	1.875/2.125	1.875	.95	.95
Cleveland	2.00	1.90	2.00	2.00	2.00	1.25	1.25
Dallas	1.9375	1.425	1.625	1.625	1.75	.80	.80/1.25
Denver	1.98*b*	1.70	1.70*b*	1.70*b*	1.90	1.10	1.10
Detroit	2.00	1.825	2.00	1.85/2.00	2.00	1.275	1.275
Kansas City	2.00	1.75	1.875	1.875	2.00	1.175	.90
Los Angeles	2.00	1.65	1.90	1.65	2.05	1.25	1.25
Minneapolis	1.825	1.65	1.75	1.70	1.85	1.15	1.15
New Orleans	1.625	1.375	1.625	1.55	1.625	.70	.80
New York	2.25*b*	2.10*b*	2.25	2.25*b*	2.25*b*	1.25	1.20
Philadelphia	2.00	1.775	1.90/2.00	2.25	2.00	1.025	1.025
Pittsburgh	2.15	2.00	2.00	2.05	2.00	1.15	1.15
St. Louis	2.00	1.95	2.00	2.20	1.90	1.00	1.00
San Francisco	2.05	1.75	2.00	1.85	2.00	1.25	.125
Seattle	1.975	1.675	1.80	1.90	1.975	1.275	1.30
Montreal*	1.17	1.06	1.11	1.07	1.17	.62	.65



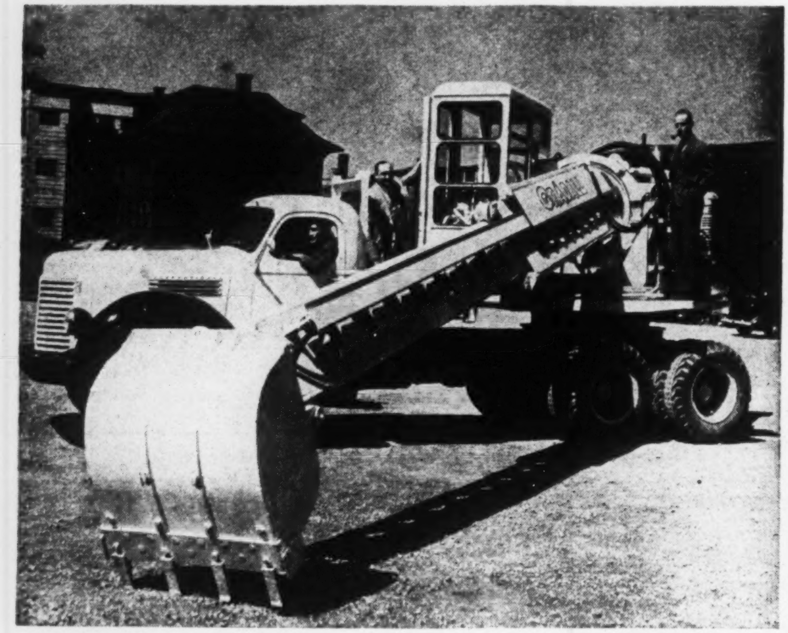
b 7 hr. day. * Cost of living bonus now included in basic wage.

ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.847

ENR Common Average: $1.073

New Aids to the Constructor

MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS



Multi-Purpose Earth Mover —The Gradall, invented by *Ray Ferwerda*, a Cleveland contractor who has licensed *The Warner & Swasey Co., Cleveland, Ohio*, as exclusive builders of the machine, is an earth mover of all-welded construction, with hydraulic controls. Its 24-ft. telescoping boom and control cab are mounted on a turntable which has a swing of 360 deg. The boom is mounted with a double-ring assembly so that the entire boom can be tilted 45 deg. in either direction from the horizontal, raised 22 deg. into the air, or lowered as much as 44 deg.

The Gradall unit has a total weight of 16,000 lb., excluding tools, and is mounted on an International Harvester six-wheel truck chassis. It is powered with an International Harvester U-9 gas engine which operates as 1,200 rpm. The unit drives four gear pumps which operate at 1,000-lbs. psi. A 12-page descriptive catalog is available.

Camera Transit—A combination of a camera and surveyor's transit has been developed for obtaining the ground control information necessary for aerial photogrammetry. The unit consists of a Type 5078-E Keuffel & Esser transit combined with a 4x5 in. plate camera with the telescope mounted on top of the camera, which is fastened to the upper limb of the transit.

The unit is used for terrestrial photogrammetry with the camera transit set up successively at a small number of points in an area in which ground control is necessary and 12 photographs taken at 30 deg. intervals throughout a circle at each of the camera stations. By such means most of the measurements needed for other control points in the area can be made in the office so ground control survey costs can be cut as much as 50 percent.—*Fairchild Camera & Instrument Corp., Jamaica, N. Y.*

Pipe Pusher—A pipe pusher that saves installation costs wherever gas, water or conduit pipe must be put underground has just been announced. Known as the Big Joe Pipe Pusher, this device is made in 5 sizes. Outstanding features claimed are simplicity of design and operation; rugged cast steel construction; pushes any length of pipe; total weight only 45 lb.—*Construction Equipment Co., Kalamazoo, Mich.*

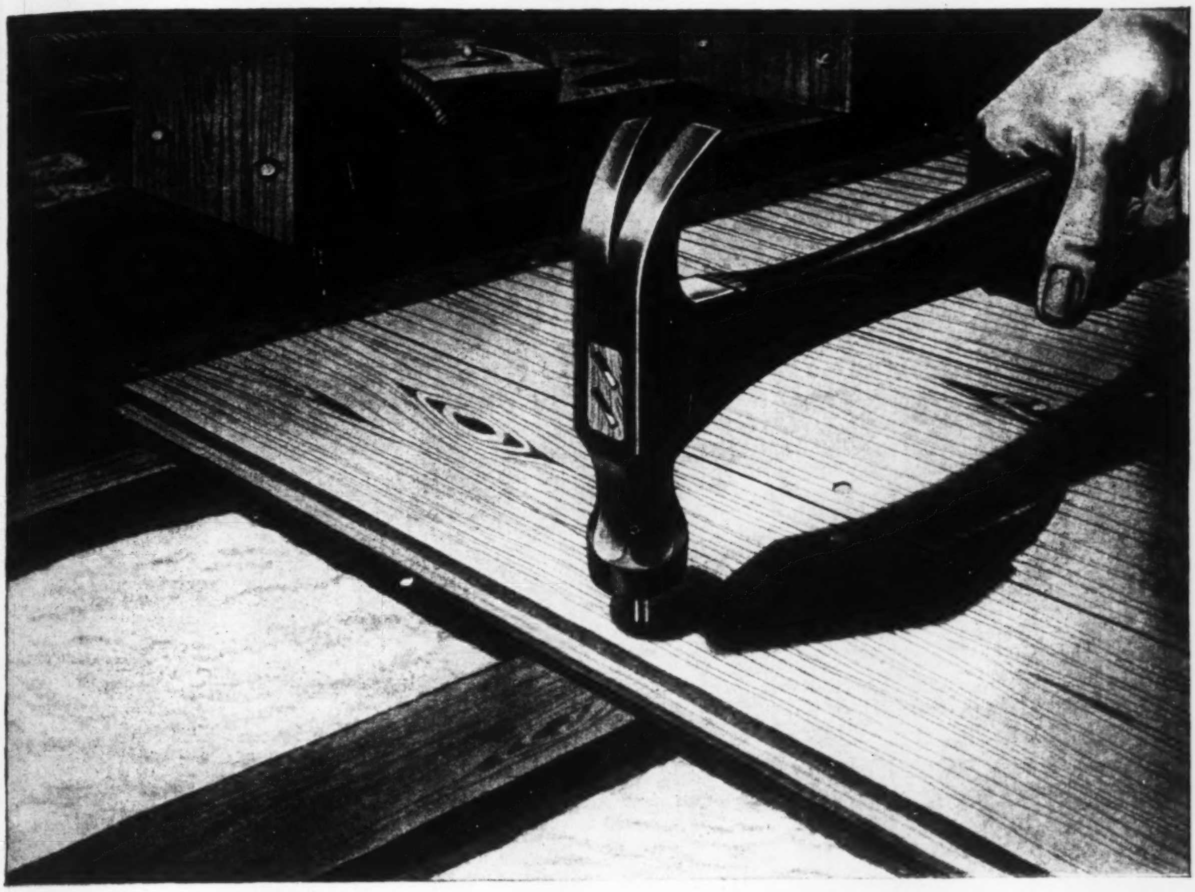
Wall and Pavement Breaker—A new pavement breaker has a detachable frame with which it is possible to operate the hammer in a horizontal position, which is effective in breaking up walls up to 12 ft. high. The hammer can be elevated or lowered with a chain air hoist and the frame attachment can be added or removed in approximately 30 minutes. Without the attachment the boom is tipped up to a vertical position.

A compressor having the capacity of 210 cfm. will operate the machine to its maximum efficiency up to sixty 10,000-lb. blows per minute. In pavement breaking the machine cuts a width ranging from 6 in. to 5 ft. and will break pavement to any desired size. In trench work the machine can be used for tamping in the backfill.—*Rapid Pavement Breaker Co., 1517 Santa Fe Ave., Los Angeles 21, Calif.*

Alternating Current Motor — A new steel frame, alternating current motor has just been produced. It is only two-thirds the size of its cast iron predecessors. The reduction in size has been accomplished without sacrifice of electrical properties but with a torque increase of 116 percent per pound of motor. It is claimed that the bearings will need no attention for at least five years, and shock resistance is increased many times. The company has designed a completely new motor and planned its manufacture in a new factory designed for large scale production.

Illustrated are "Life-Line" motors on the finishing line at the Buffalo plant.—*Westinghouse Electric Corp., Buffalo, N. Y.*

Sand And Gravel Preparation Plant—A new, standardized, demountable sand and gravel preparation plant features superior screening and dewatering, using standard units designed for economical dismantling, reassembling and moving to new locations. Its



"Down-to-earth" floors call for down-to-earth thinking

Whenever you lay floors at grade, or sub grade . . . it's particularly important to use pressure-treated wood.

The moisture that is almost always present encourages the growth of fungi that cause decay. Pressure treatment poisons the food supply of the fungi. Treated wood delivers the many years of service that you have a right to expect. You'll find, too, that pressure treatment improves the wear resistance of the wood . . . a profitable extra dividend.

Remember, decay in wood is not the natural result of old age, but of *avoidable disease*. In 21 modern, fully-equipped treating plants, Koppers "inoculates" all varieties of structural lumber against this threat. Special selected treatments give enduring protection against the hazards of the individual service: decay, termites or marine borers . . . acid attack . . . fire. Our Bulletin G-23 will give you full information on the various treatments, and show you some of the many places where pressure-treated wood is serving and saving. Ask for a copy. Koppers Company, Inc., Pittsburgh 19, Pa.

K
KOPPERS

PRESSURE-TREATED WOOD
KOPPERS COMPANY, INC.
PITTSBURGH 19, PA.

SELF-SEALING TO *Prevent Corrosion* OF BOLT THREADS

—with the Red Elastic Collar that protects the threads against Liquid Seepage

Moisture cannot penetrate the Red Elastic Collar. Study the heavily corroded bolt and nut assembly in the unretouched test photograph. It has been subjected to the equivalent of three years' exposure to moisture . . . to industrial smoke and grime . . . to climatic change. Study the same bolt with the nut removed. Look at the bolt threads that were inside the Elastic Stop Nut. They're as good as new! Why? Because the Red Elastic Collar protects them permanently against Liquid Seepage—and Corrosion.

Elastic Stop Nuts are easily removed because they cannot 'rust solid'. They prevent fasteners from failing because of corrosion weakened threads.

Here's a challenge: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts—FREE, in experimental quantities. For further information or literature address: Elastic Stop Nut Corporation of America, Union, New Jersey. Agents and Representatives located in principal cities.

The RED ELASTIC COLLAR

—denoting an ESNA product—

. . . is threadless and permanently elastic. Every bolt—*regardless of commercial tolerances*—impresses (does not cut) its full thread contact in the Red Elastic Collar. This threading action produces a compressive, radial-reactive pressure against *both* the top and bottom sides of the bolt threads . . . insures a permanently tight, full contact between the bolt and nut threads . . . and makes all Elastic Stop Nuts self-sealing against Liquid Seepage.

As a result, all Elastic Stop Nuts protect permanently against thread corrosion.

ESNA

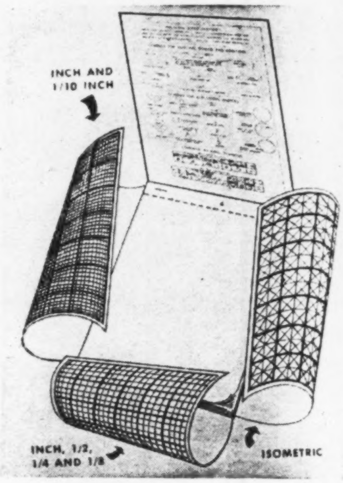
ELASTIC STOP NUTS

INTERNAL WRENCHING · ANCHOR · INSTRUMENT MOUNTING · SPLINE · CLINCH · GANG CHANNEL

PRODUCTS OF: ELASTIC STOP NUT CORPORATION OF AMERICA

equipment includes belt conveyors, scrubber, crusher, double-deck vibrating screens, sand dewatering screw conveyor, and the necessary power drive units.

To facilitate moving, the belt conveyors are mounted on steel frames made up in 20-ft. sections, with suitable legs for bolting and unbolting. All units are sectional, for quick dismantling and moving, without sacrificing efficiency or capacity.—*Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.*



Scale Drawing Pad—"Jiffy Sketch" is the name of a scale drawing pad with which to make properly proportioned drawings without use of ruler, drafting board or T-square. It may be used in the shop, field or office. The pad contains 75 sheets of high quality tracing tissue, in a cover jacket of four cardboard flaps. Various scales are printed on three of the flaps. To use the pad the cover flap is folded back and one of the tissue sheets is then placed over the scale desired. The drawing is made accurately to scale with the aid of the printed lines which show through the tissue.

The pad measures approximately 9x12 in. Sheets are perforated for easy removal. Information is printed on the back of each cover flap—basic mechanical drafting standards; electrical, welding and architectural symbols; decimals of a foot; decimal equivalents of fractions, with circumferences and areas of circles.—*Jiffy Sales Co., 1813 East 37th St., Cleveland 14, O.*

Soil Resistivity Meter—Of importance to all concerned with corrosive action on underground installations is a meter that gives accurately and directly the electrical resistivity of the soil. Readily portable, the 19-lb unit has a probe tip that can be inserted to any

MORETRENCH WELLPOINTS FOR WET SEWERS

14′ deep—11′ of water in sand and clay—PROGRESS: 300′ per day!

DO YOU WANT TO

get more footage per day?
eliminate sheeting?
save time and money on your wet work?

Install a Moretrench Wellpoint System
It's the Proven Way To Change a Wet Job
Into a Dry One—a money-waster into a money-maker

MORETRENCH CORPORATION

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3037 So. Christiana Ave.
CHICAGO 23, ILL.

315 W. 25th St.
HOUSTON 8, TEX.

2424 Chicago Ave.
TAMPA 6, FLA.

DARAX AEA

Takes the guesswork out of

AIR-ENTRAINED CONCRETE

It is generally recognized that the richness of the mix as well as the character and gradation of the aggregates used on the job largely determine the amount of air entrained. By using DAREX AEA as an addition at the mixer, you can meet any desired specification and control it.

DAREX AEA is a tested and proved water soluble air-entraining agent that is safe, harmless, and that comes ready to use. Simple automatic metering devices for DAREX are available for direct attachment to pavers or mixers. DAREX is not super sensitive. And best of all, DAREX AEA is economical to use and leads to direct savings.

Even though air-entrained concrete is not specified on your present jobs, you will find that the improved plasticity produced by DAREX—with little or no sacrifice in strength—gives you savings in time and labor that puts dollars in your pocket. Order a drum today and prove to yourself that DAREX can produce better concrete with a saving in time and labor. Warehouse stocks of DAREX are available nationally through our distributors.

DEWEY AND ALMY CHEMICAL COMPANY
CAMBRIDGE · CHICAGO · OAKLAND

Check These Advantages of DAREX

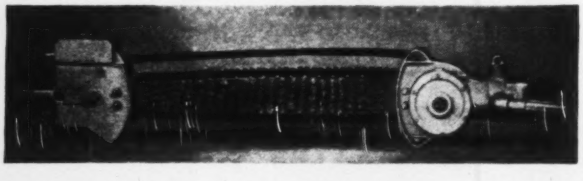
- ✓ 1 Improved plasticity
- ✓ 2 Improved durability
- ✓ 3 Improved water-proofing properties
- ✓ 4 Controlled air
- ✓ 5 Economical
- ✓ 6 Comes ready to use

IN AIR-ENTRAINING CONCRETES IT'S
Controlled Air
THAT COUNTS

*

To get the most from air-entraining concrete—hold cement factor by redesigning mix—and use DAREX AEA.

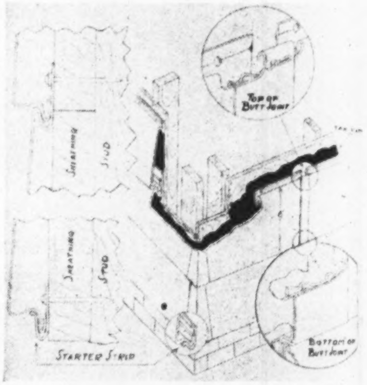
Investigate this Modern Power Tool



For clearing and cutting timbers and piles with speed and accuracy, this modern power tool is just what you need—especially designed to meet post-war construction requirements. Pneumatic model illustrated. Gas and electric models available also.

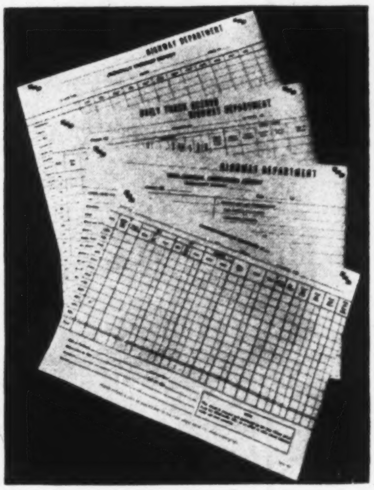
LOMBARD CHAIN SAWS
Mfgr'd by Lombard Governor Corp., 200 Main St., Ashland, Mass.

level and will indicate resistivity within 12 in. of the point. It is most useful in determining the probable electrolysis and corrosion conditions in advance of installation of pipes and cables so that preventive measures can be taken.—*Associated Research, Inc., 231 South Green St., Chicago 7, Ill.*



Aluminum Building Products

A new line of aluminum building products ready for immediate delivery includes materials for all types of homes, light commercial and industrial structures, aircraft hangars, etc. Four types of sheet roofing and siding are offered, as well as aluminum shingles with interlocking watertight sides and fitting top and bottom flanges.—*Reynolds Metals Co., Louisville, Ky.*



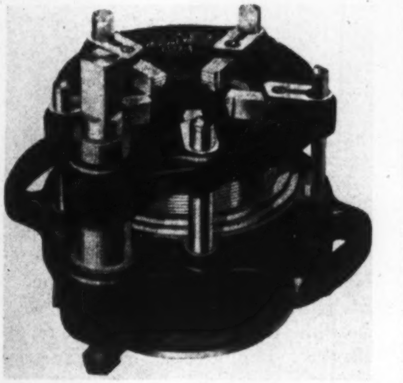
Truck Cost Records—A complete set of sample forms required to set up a simplified system of keeping operating cost records is the result of a system developed over 35 years of truck manufacture and repair. This service aids owners who do not wish to set up an elaborate cost keeping system, and answers such questions as: Is the truck efficient or has it outlived its usefulness? Is the gas mileage high? Low? Why? Which is the best size truck for the job? Which is the best truck for the job?

Only four forms are used: the daily driver's report, repair labor slips, monthly report and yearly report.

Requests for sample forms should be mailed to *Cost Records Department; Service Division; The Four Wheel Drive Auto Co., Clintonville, Wis.*

Air Hoist—A small, lightweight, air-powered hoist, the "Air-Winch," capable of lifting 500 lb. yet weighing only 85 lb., has been announced. It has a rope capacity of 150 ft. of ¼-in. rope, is only 18 in. long 9½ in. high and 11 in. wide. It is powered by a simple, four-cylinder, reversible, piston-type air motor and can be used in many different ways about the average construction job.

Light enough for one man to move quickly from place to place, the Sullivan AW-80 hoist can be mounted in any position on car, timber, column or bar. Regular equipment includes a set of clamps for column or bar mounting but chains or common drift bolts may be used to secure winch if desired.—*Sullivan Division, Joy Mfg. Co., Michigan City, Ind.*



Geared Pipe Threader—A quick-setting workholder and new balanced loop handles are two innovations on the new 4P geared pipe threader. The workholder enables a worker to set the threader exactly to size before being placed on the pipe. The balanced loop handles on the enclosed gear case prevent slipping or tipping over.—*Ridge Tool Co., Elyria, Ohio.*

Solenoid Two-Way Valve—A new solenoid-operated two-way valve combines a solenoid with a two-way valve in one small, compact unit, achieving convenient remote control of the hydraulic valve in water and sewage disposal plants. There is a saving of the tubing and oil involved in the conventional

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pumps
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MUSCATINE IOWA

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The seal that keeps a Carver Pump always fast-priming and non-leaking is made of diamond-hard tungsten-carbide so it is practically immune to wear. . . . Carver Pumps are offered with a choice of power and mounting in sizes from 1½" to 10".

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FORMING and HANDLING Equipment FOR ALL CONCRETE PROJECTS
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Rigid Radius Form

Try Heltzel steel forms, and you'll discover why they give dependable service for 20 years or more. The value of your Heltzel forms increases with each additional mile of paving, and you'll find that each job you set is as uniform as the ones before. The low cost of equipment per year of service plus reduced maintenance and conditioning costs, effect substantial savings. Write today for copies of the Heltzel catalogs.

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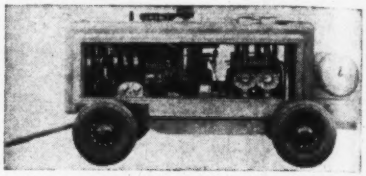
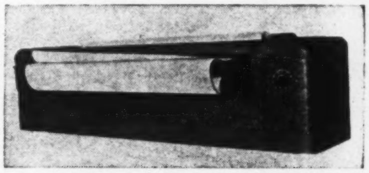
HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

all-hydraulic remote control system and the small size of the device makes it ideal for installation in hard-to-reach or congested areas, when such installations are desirable.—*Electrol, Inc., 85 Grand St., Kingston, N. Y.*



Compressor—Known as "315-W" (gas) and 315 WD (diesel), a new compressor unit produces 315 cu. ft. of free air per minute at 100 lb. pressure. It is available in standard skid, steel wheel trailer, and pneumatic-tired trailer mounting styles, and flanged wheel types for railroad work. On trailers, spring-mounting is included without extra cost.

The compressor unit consists of two banks of three cylinders, each bank being arranged in W form. This construction together with a short 4 in. piston stroke, reduces compressor vibration to a minimum.—*Davey Compressor Co., Kent, Ohio.*



Continuous Printers —New improved "B-2 and B-3" table-type continuous printers offer a number of postwar improvements that make possible faster exposure, finer reproduction, and greater operating efficiency, for intermittent or continuous duty. They expose direct process black and white prints, blue prints, and ammonia-type prints, from tracings, charts, drawings, letters, etc. and produce clear, sharp, true-to-scale prints up to 44 in. wide in a continuous operation; from cut sheets or roll stock, in any lengths, at speeds from 6 in. to 42 in. per minute.—*Peck & Harvey, 5736 N. Western Ave., Chicago 45, Ill.*

Steam Cleaner—a streamline design steam cleaning machine known as Model JO Hpressure Jenny instantaneous steam cleaner is a compact, portable, steel-fabricated, electric-welded unit with all machinery end-mounted and fully accessible. It can be furnished with or without a removable, die-formed steel machinery cover. Large, semi-

Blow 432 Million Cu. Ft. of Air Per Day!

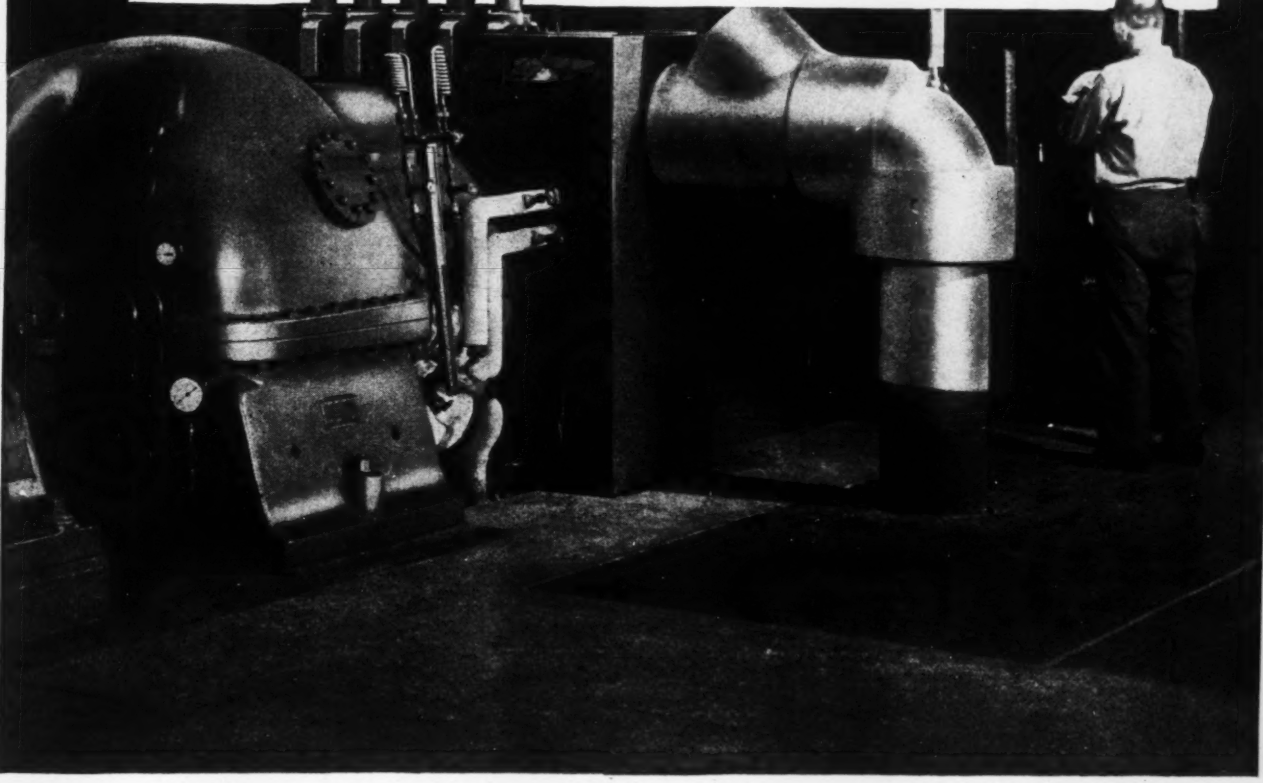
Allis-Chalmers Blower-Turbine Teams Will Set Record Capacity in World's Largest Sewage Plant

SUFFICIENT AIR to aerate 400 million gallons of sewage daily!

That's the record breaking job of 3 Allis-Chalmers blower-turbine teams in the world's largest sewage plant being built by the Chicago Sanitary District.

These huge blowers, largest ever used in the activated sludge process of sewage treatment, are the two stage types having opposing groups of impellers. Each blower has a normal capacity of 100,000 cfm at 7.75 psig and is driven by a condensing, impulse-reaction type steam turbine. One of these blower-turbine teams is already in operation.

SIGNIFICANCE: This kind of equipment engineering is typical of what you too can expect from Allis-Chalmers. For A-C builds a wide range of public works equipment for cities of all sizes, metropolitan, medium and small. For prompt help with your equipment problems see your nearby A-C representative or write to ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2057

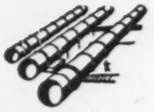


Outdoor, indoor switchgear; electrical distribution equipment.

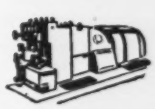
Motors for every requirement, 1 hp and over; Texrope V-Belts to 6000 hp.

Blowers and compressors in most sizes for all applications.

Pumps—all types, sizes to 600,000 gpm . . . heads to 3500 ft or more.



Wide line of equipment for sewage treatment and sludge disposal.



Steam turbines from 10-200,000 hp . . . other generation equipment.

Willson Makes NEWS In PLASTIC EYE PROTECTION

NEW FeatherSpec

For Light Grinding, Wood Working, Spot Welding and Similar Jobs

Here's the solution to the problem of keeping safety spectacles on workers in semi-hazardous jobs--the new Willson FeatherSpec. So light in weight (less than an ounce) it can be worn all day long with complete comfort—even over regular glasses.

FeatherSpec furnishes 2-way eye safety—from impact hazards and from glare. The large one-piece lens provides wide angle vision as well as high frontal impact strength. The special "suspension-lock" frame holds the lens firmly in position, yet permits replacement in ten seconds!

Give your workers the benefit of FeatherSpec's new comfort and extra protective features. Available in two lens shades—clear or the new Willson Tru-Hue green, which keeps out glare without color distortion.

MORE PROTECTION WITH PLASTICS

WILLSON MONO-GOGGLE—Made of shatterproof plastic for over-all eye and nose safety. MonoGoggle wearers get extra comfort because of light weight, rolled contact edges, adjustable headband. Clear or Willson Tru-Hue green lens. May be worn over glasses.

WILLSON PROTECTO-SHIELD* Furnishes full-time safety for both front and sides of face. Lightweight, snug-fitting, comfortable. Tilted visor available in three lengths. Clear or Tru-Hue green plastic.

For help with your eye protection problems, consult your Willson distributor or write to Willson Products, Inc., 100 Thorn Street, Reading, Pa.

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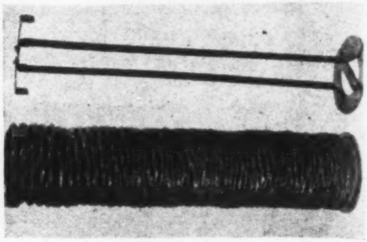
steel wheels and a steering tongue afford easy portability and maximum utility, permitting easy transfer from one cleaning job to another. Oil or gas fired units are optional, and the only requirements for operation are an electric current outlet and a hose connection to water supply.

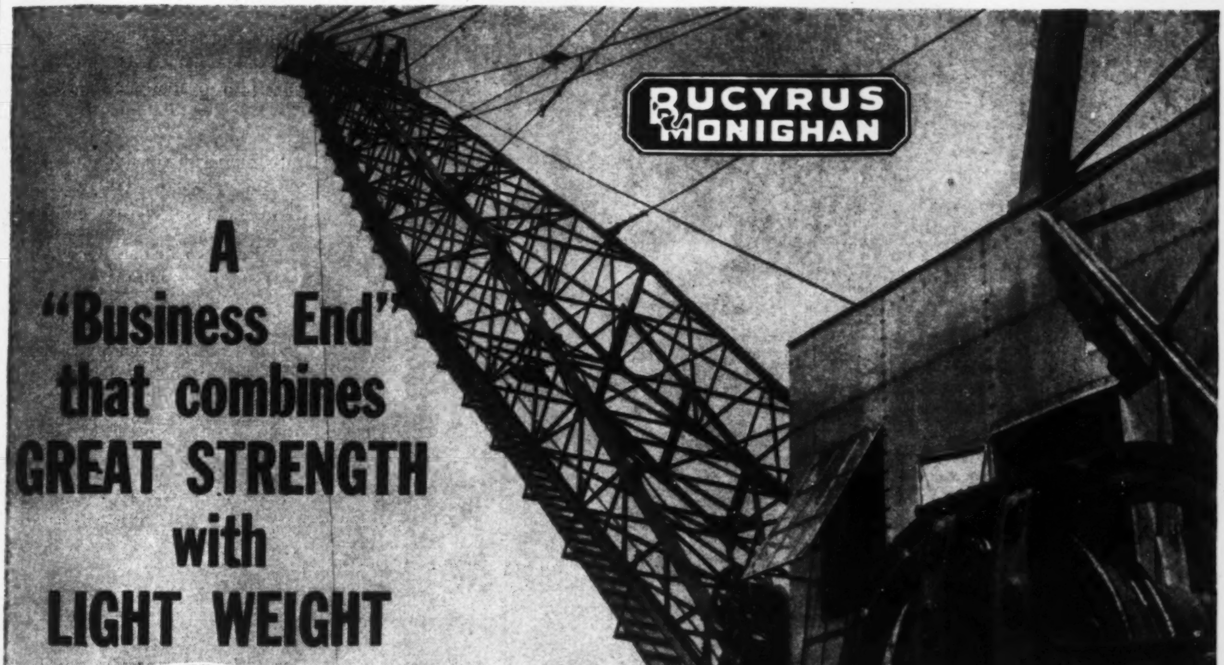
This cleaner is described in a two-page specification circular, showing details of the complete accessibility, unit control panel, and other features.—*Homestead Valve Mfg. Co., Coraopolis, Pa.*



Retractable Tube Carrier—A combination carrier and stowage rack for convenience in handling retractable tubing, or storing it when not in use, has been developed. The rack, called "Spira-Tote," comes in various sizes to accommodate various lengths and diameters of Spiratube. The tubing, which is non-collapsible in operation, is easily piled upon the rack and locked into position. Hinged extension pieces at the top of the rack turn to permit the tubing to slip onto the rack, then move out, locking tubing in place.—*The Warner Brothers Co., Spiratube Division, Bridgeport 1, Conn.*

Paper Coating Process—A new process for coating direct print and blue print paper allows the paper to keep its properties over long periods of time, with less background discoloration on direct prints and improved, clearer whites on blue prints.—*Wing-Valentine Co., 7120 North Clark St., Chicago 26, Ill.*

Machinery Lubricators—Designed in four sizes, with lubricant capacities ranging from ½ to 8 oz., pressure filled Gun-Fil lubricators automatically dispense oil or grease in a measured, uniform flow to a moving bearing, and stop feeding lubricant when a bearing becomes motionless. These lubricators assure controlled lubrication over a long period of time. Six interchangeable valves with distinctive colored caps for identification exert varying degrees of control of feed on greases of different densities.—*Gray Co., Inc., 60 11 Ave. N. E., Minneapolis 13, Minn.*



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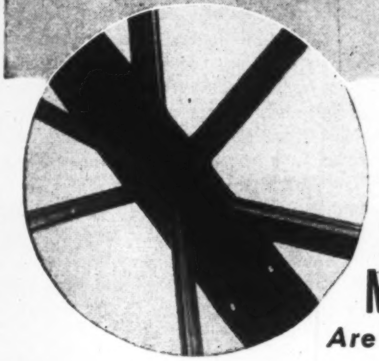
A "Business End" that combines GREAT STRENGTH with LIGHT WEIGHT



One of many reasons why

BUCYRUS-MONIGHANS

Are Years Ahead

STRONG . . . light . . . efficient, the Bucyrus-Monighan wide all welded tubular-laced boom has made dragline history around the world. Its great strength permits it to handle the digging loads with ease; its wide shape withstands the fast-swing stresses of high speed operation; its light weight relieves the machine of swing inertia and roller loads, adding greatly to the speed of the digging cycle.

The superior design of Bucyrus-Monighan booms typifies the kind of engineering, carried through the entire line of machines, that has made Bucyrus-Monighans famous for fast digging, long life, and low maintenance on important excavating projects all over the world.

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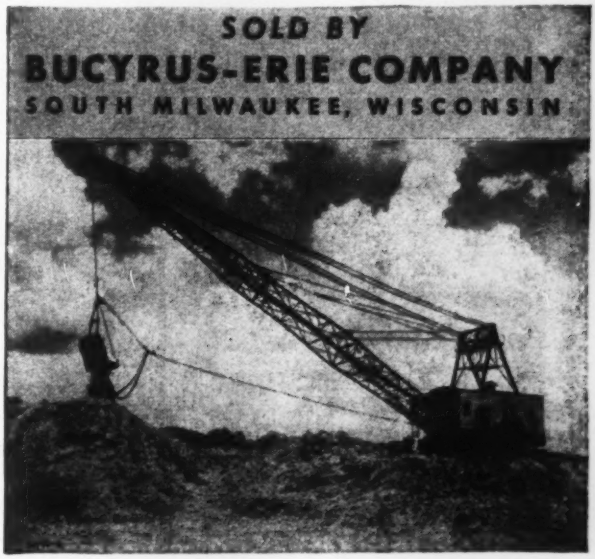

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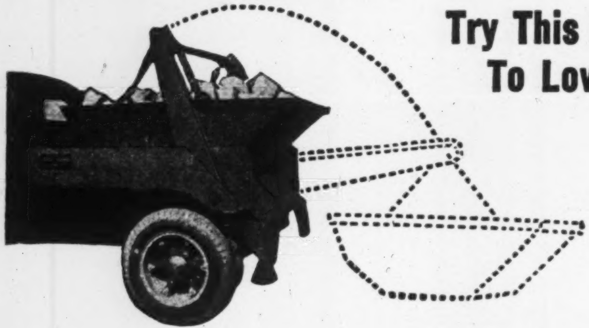

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• Engineers and construction men throughout the nation report amazing savings—as high as 300 to 400% in truck maintenance and labor costs alone—with the use of this highly versatile system of materials handling. A Brooks LOAD LUGGER installed on one of your trucks serves any number of detachable bucket bodies. Your loading crews keep busy constantly loading (at ground level) while the truck is constantly hauling, dumping, returning empty bucket and picking up the next full one. Buckets available from 1½ to 4 cu. yds. Write for catalog and list of users today.

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Men and Jobs

Lt. Colonel K. M. Pattee, newly appointed executive of the New England Division Office, Corps of Engineers, has begun his duties as chief staff assistant to **Brig. Gen. D. L. Weart,** in charge of all military and civilian construction programs throughout New England. Colonel Pattee, a resident of Cambridge for 20 years and a veteran of both world wars, rose from the rank of private in World War I to become a full colonel in World War II.

Pattee attended Limington Academy and the University of Maine. He completed engineering courses at Pratt Institute, University of Wisconsin, and Massachusetts Institute of Technology. He has performed special research work on structural and reinforced concrete design and first class floor and wall systems suitable for modernistic buildings. Prior to going overseas Colonel Pattee was responsible for the completion of five major Army construction projects, one of which was Camp Edwards, Mass. In February, 1944, he was assigned as district engineer at the Hump Air Fields in Northeast Assam, India. It was from these bases that all supplies and personnel were flown into China. In 1945 he became base engineer at Calcutta, where he had charge of engineering and construction for all of India. His performance of duty on this assignment earned for him the Bronze Star for meritorious achievement.

The following Brazilian engineers are now visiting in this country: **Dr. Jorge Whitaker da Cunha Lima,** chief engineer, Department of Roads, Sao Paulo; **Dr. Paulo E. Gomes dos Reis,** technical director of "Vias e Viaturas S/A" Sao Paulo; and **Dr. Ariovaldo de Almeida Vianna,** director, State Highway Department, Sao Paulo. Drs. Lima and Vianna are visiting the United States as guests of The Institute of Inter-American Affairs, while Dr. dos Reis is here independently.

William H. Kimball, William H. Romine, Howard T. Sindt, and **Edwin J. Snow,** all of the Davenport, Iowa, area, have opened a consulting engineer office in that city. They will use the firm name of Romine, Sindt & Snow. Mr. Kimball will act mainly as consultant. Mr. Romine, who has been en-

Their Performance Speaks Louder Than Words

Above — A Homelite Generator on the job furnishes plenty of power to operate time-saving electric saws.

Below — A Homelite Pump and Generator make the right combination for speeding dewatering jobs at night.

We'd much rather show you Homelite Portable Gasoline-Engine-Driven Pumps and Generators *in action* than just talk about them. Action speaks louder than words.

So why not let us give you a free demonstration . . . any place you want it. See how fast a Homelite pumps, how quickly it primes itself, how easily it handles heavy liquids and solids. See all the cost-cutting operations you can put to good use on day or night work with steady electric power furnished by a handy Homelite Generator.

To get such a demonstration, free from all obligations, simply write. We'll have our nearest representative get in touch with you.

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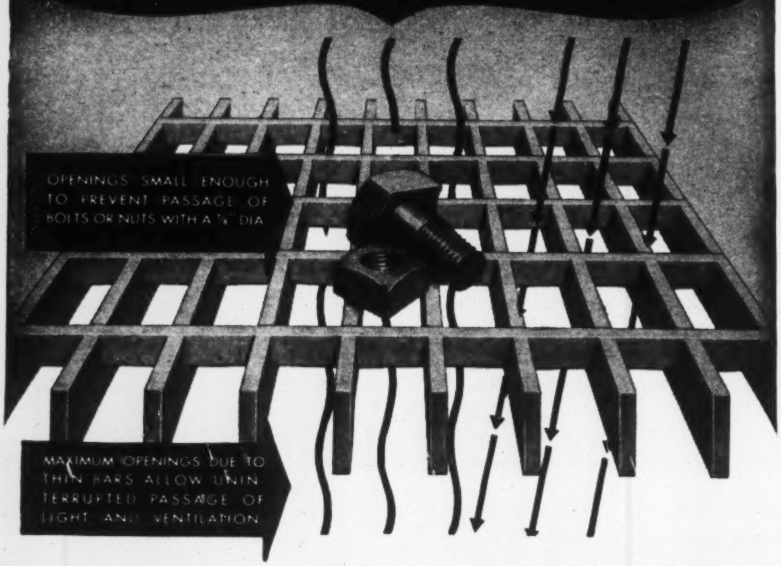
This is TRI-LOK OPEN STEEL FLOORING


OPENINGS SMALL ENOUGH TO PREVENT PASSAGE OF BOLTS OR NUTS WITH A ¾" DIA
MAXIMUM OPENINGS DUE TO THIN BARS ALLOW UNINTERRUPTED PASSAGE OF LIGHT AND VENTILATION

Extra strong construction — openings closely spaced — available in rectangular, diagonal and U shapes — with Safety Steps. Ask for Bulletin 1140.

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(Distributor for THE TRI-LOK COMPANY)

DRAVO

gaged in engineering work since 1920, will be in active charge of the office. For some years he has been superintendent of Davenport parks and at the present time is a director of the American Institute of Park Executives. Mr. Sindt is engineer for the Davenport Planning Commission, and Mr. Snow for the past several years has been employed as a civil engineer with the Rock Island District, U. S. Army Engineers. The firm will engaged in the investigations, supervision and planning of municipal improvements, highways, and other engineering works, including the development of towns, subdivisions and parks.

E. W. Lane has been appointed an hydraulic consulting engineer with the Bureau of Reclamation, it was announced in Denver, Colo., recently by the Office of the Chief Engineer. Lane, formerly professor of hydraulic engineering at the University of Iowa, had been engaged by private engineering firms and government agencies prior to joining the faculty at the Iowa university. He was with the Morgan Engineering Co. in China for three years. Lane was previously associated with the bureau from 1929 to 1935.

Joseph C. Jones, assistant division engineer for the Wisconsin State Highway Commission, has been appointed division engineer to succeed D. J. Minahan, killed in an automobile accident.

Maj. Russell Vincent, Corps of Engineers, has reported for duty as an assistant to Col. A. Riani, district engineer at Detroit, Mich., after assignment to the command and general staff school at Fort Leavenworth, Kan. He was a construction engineer for the Navy Department before entering the service in 1940, and is a graduate of the University of Washington at Seattle.

Lt. Col. W. B. Robison, for five years with Army Engineers in the European theater, has returned to his prewar post as division engineer in the Toledo, Ohio, engineering department. For the last year, he was with the control office for I. G. Farben Industries in Germany.

Frank J. Sheridan, engineer, has opened a consulting office in Sioux Falls, S. D. He will deal with structural designs, stress analysis, building material estimates and general design and construction surveys.

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3 TYPES DESIGNED FOR EVERY DIGGING CONDITION

LS . . .	A lighter weight bucket designed for levee and drainage work.
TS . . .	A medium weight bucket, classified as a general purpose bucket.
HS . . .	A heavy duty bucket for moving shale or any hard formation.

3/8 to 30 Cubic Yds.

HENDRIX *Lightweight* DRAGLINE BUCKETS

Write for descriptive literature—
or ask your dealer.

You automatically step up the YARDAGE of your dragline by hooking up a Hendrix Lightweight Bucket! It's 20% to 40% lighter than other buckets, type for type! Can be used on a machine designed for small operations and still maintain the allowable loaded weight. You'll get bigger payloads on operations requiring a long boom, and in wet digging you'll increase your payloads by leaving the water in the pit. We took the load ***out of the bucket...*** to let you put it ***inside!***

- ★ 20% to 40% lighter than other buckets, type for type.
- ★ All welded construction for greater strength and durability.
- ★ Manganese Steel chains, fittings, and reversible tooth points.
- ★ Full Pay Load every trip, even in wet diggings.
- ★ Perfect Balance; handles easier, fills faster, dumps cleaner.
- ★ Three Types; light, medium, and heavy duty. With or without perforations.

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STRONGER!

SAFER!

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SOLVAY
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Temperatures of 50°F., or lower tend to lower the development of strength. This means slower form removal and delay in finishing the job. By adding SOLVAY Calcium Chloride to the mix, you offset the effect of low temperatures. It also produces concrete of high ultimate strength. This cuts costs three ways: (1) Earlier form removal and reuse. (2) Quicker use of finished concrete. (3) Safer, stronger concrete.

●

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40 Rector Street New York 6, N. Y.

Dan Farrell, Jr., has been appointed assistant district engineer for the Bureau of Community Facilities, Federal Works Agency, with headquarters at Omaha, Neb., working under **C. R. Smith** the district engineer.

Frank Hubner, Bluffton, Ind., district highway superintendent, has resigned in order to give more time to building new homes in that city. **Max Farlow** will assume charge of that district until a successor is named.

Ray Case has resigned as superintendent of the Geneva, Ont., water and sewer departments, his post for six years, but will remain as village engineer and head of the street dept.

Elbert H. Southard, engineer with the United States Public Health Service, who recently has been working on a typhus control project at Winston-Salem, N. C., has been assigned to handle engineering details in connection with a rodent control program at Durham, N. C., where an ordnance recently was adopted requiring the rat-proofing of all business buildings.

Edward A. Conover of Raleigh, N. C., has been named community planning consultant for the North Carolina Planning Board and will head the community planning department recently set up by the board to assist in developing better planning methods for North Carolina cities and towns. The board also has named a community planning committee to advise the new department. Members of the committee include **Frank L. Dieter,** municipal planning engineer at Durham, N. C.

J. P. Martel has been appointed manager of the design division, engineering department, of the DuPont Co. to succeed **Melvin F. Wood,** recently appointed assistant chief engineer of the company. Mr. Martel attended the U. S. Naval Academy.

Pennsylvania's Highway Department has announced these appointments: District 9, Hollidaysburg—**Russell E. Noel,** Bellwood, project engineer; **Donald J. McIntyre,** Broad Township, project engineer. District 11, Pittsburgh—**Henry E. Caton,** Duquesne, project engineer; **Henry L. Glaneman,** Pittsburgh, project engineer. District 12, Uniontown—**Samuel J. Robinson,** Uniontown, resident engineer; **Joseph B. Alexander,** Uniontown, project engineer.

Lane McShaw, formerly in the Navy V-12 program, has been named assistant city engineer, Champaign, Ill.

Arthur E. May, Jr., graduate in engineering from Queens University,

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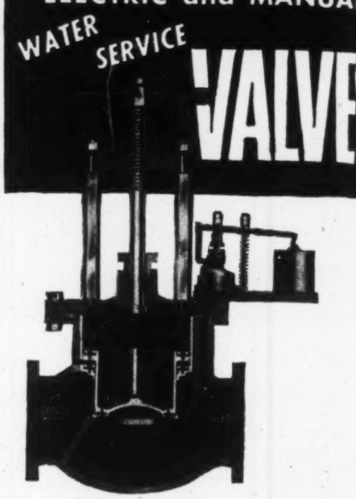

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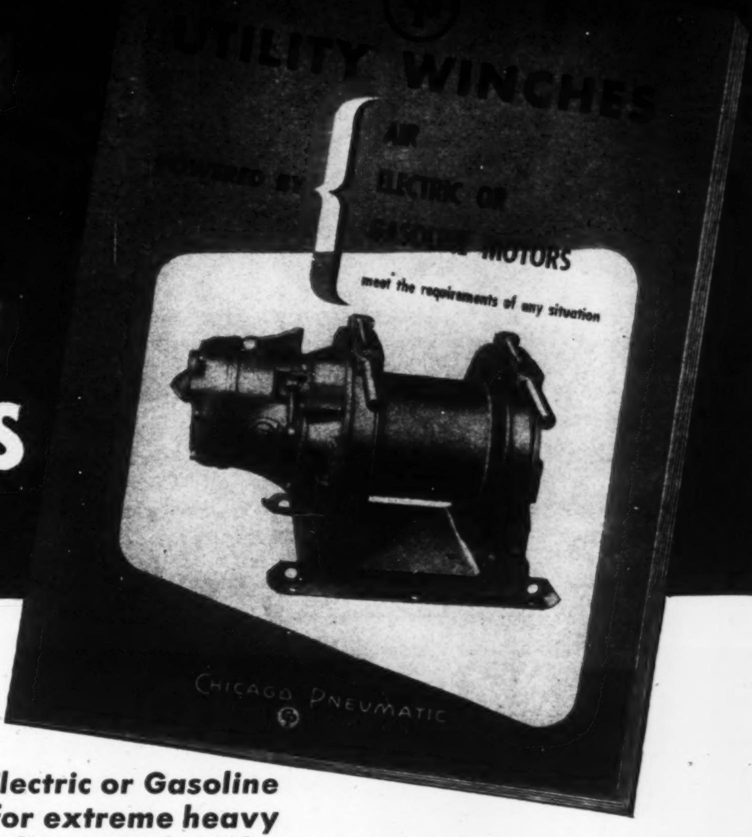

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ELECTRIC OR
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meet the requirements of any situation

CHICAGO PNEUMATIC

...powered by Air, Electric or Gasoline Motors...Designed for extreme heavy duty service, yet light enough to be readily portable.

OUTSTANDING FEATURES

- Rotary Vane Type Air Motor—no reciprocating parts.
- Standard Flange Mounting of Motors—shift from air to electric drive with speed and minimum cost.
- Cathead Extension on Drum—rotates when drum load is held stationary. Use the cathead to "spot" your load.
- Compound Epicyclic Gearing — totally enclosed — trouble free — simplifies brake and clutch control.
- Power Lowering—minimizes bouncing of load on long cables.
- Extremely Flexible Control — permits smooth handling of the load with delicate inching quality. Drum is reversible on air and electric units.

* * *

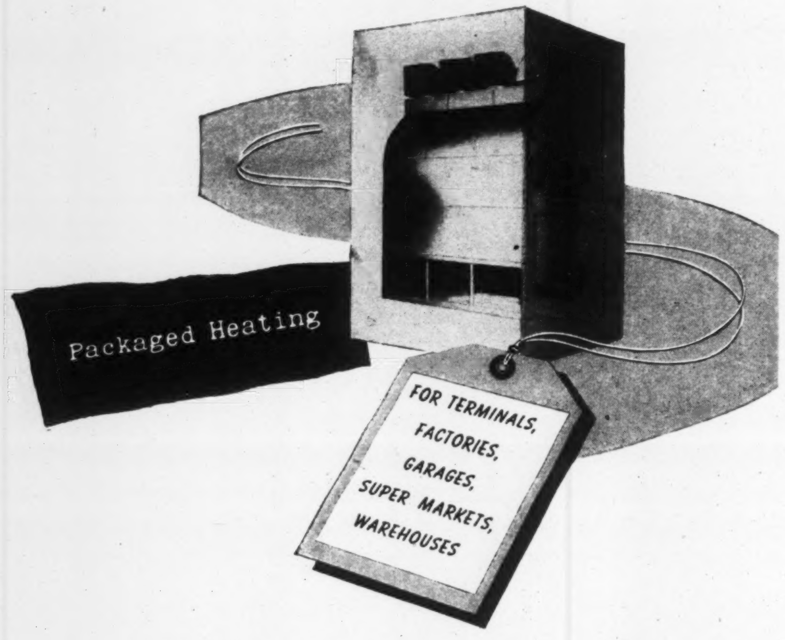
A Full Assortment of Accessories is available, including mounting bracket with swivel base, adjustable bracket for mounting winch on trees, poles, pipes, etc.

For full information write for Bulletin SP-2057

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



The problem of providing heat for buildings containing large, unobstructed areas is economically and efficiently solved by the use of Dravo Direct Fired Warm Air Heating. This method provides self-contained heaters in sizes from 300,000 Btu to 2,000,000 Btu that can be used in single or multiple units.

We call it "packaged heating" because it provides a known quantity of heat output and comes to you as a complete, self-contained unit. Installation requirements are simple—electric power, fuel line and stack.

Dravo Heating is extremely flexible in use. Units can be moved as heat requirements change. Heat for office areas can be diverted by means of ductwork. If floor space is limited, Dravo Heaters can be suspended from wall or ceiling.

Pushbutton control eliminates specialized attendant. Maintenance is neglible. Gas or oil fired units provide fuel-to-air efficiencies of 80 to 85%.

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HEATING

The Dravo Heater has effected a new economy in open space heating. Let us point out its advantages on your next heating job. Bulletin 514 free on request. Dravo Corporation, 300 Penn Avenue, Pittsburgh 22, Pa.

MacArthur

36 YEARS INSTALLING PILES
OF EVERY TYPE

CAST-IN-PLACE — STEEL
CONCRETE — SECTIONAL PIPE
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SOIL AND ROCK EXPLORATION

MacARTHUR CONCRETE PILE CORPORATION
18 EAST 48th STREET, NEW YORK 17, N. Y.
BOSTON • CINCINNATI • NEW ORLEANS

Kingston, Ont., has been appointed city engineer at Bend, Ore. He succeeds **Jack Taber**, who resigned to join the Bend Chamber of Commerce.

Frank L. Cole, chief of the personnel branch of the North Pacific division of Army Engineers, has been presented with the meritorious civilian service certificate in recognition of outstanding achievement in personnel work in the division during the war. The presentation was made by Col. Theron D. Weaver, division engineer. Cole joined the Portland district in October, 1933, and served the Pacific division at Salt Lake City during the war, returning to Portland last March.

Col. Frank L. Beadle, executive officer of the Portland, Ore., district, Army Engineers, has been awarded the Oak-leaf Cluster to the Legion of Merit for his services as island engineer of Tinian, Marianas Islands, and later as chief of staff to the island commander and commanding general of Tinian's Army garrison force.

At the same ceremony, **John W. Miles**, now assistant to the chief of the engineering division of the Portland district, was awarded the bronze star for service as a lieutenant colonel with the construction division of the chief of engineers, European theater of operations, from June to October, 1944.

Colonel Beadle was cited for coordinating a joint Army and Navy building and maintenance program on Tinian and supervising the operation of a command formed of the several services.

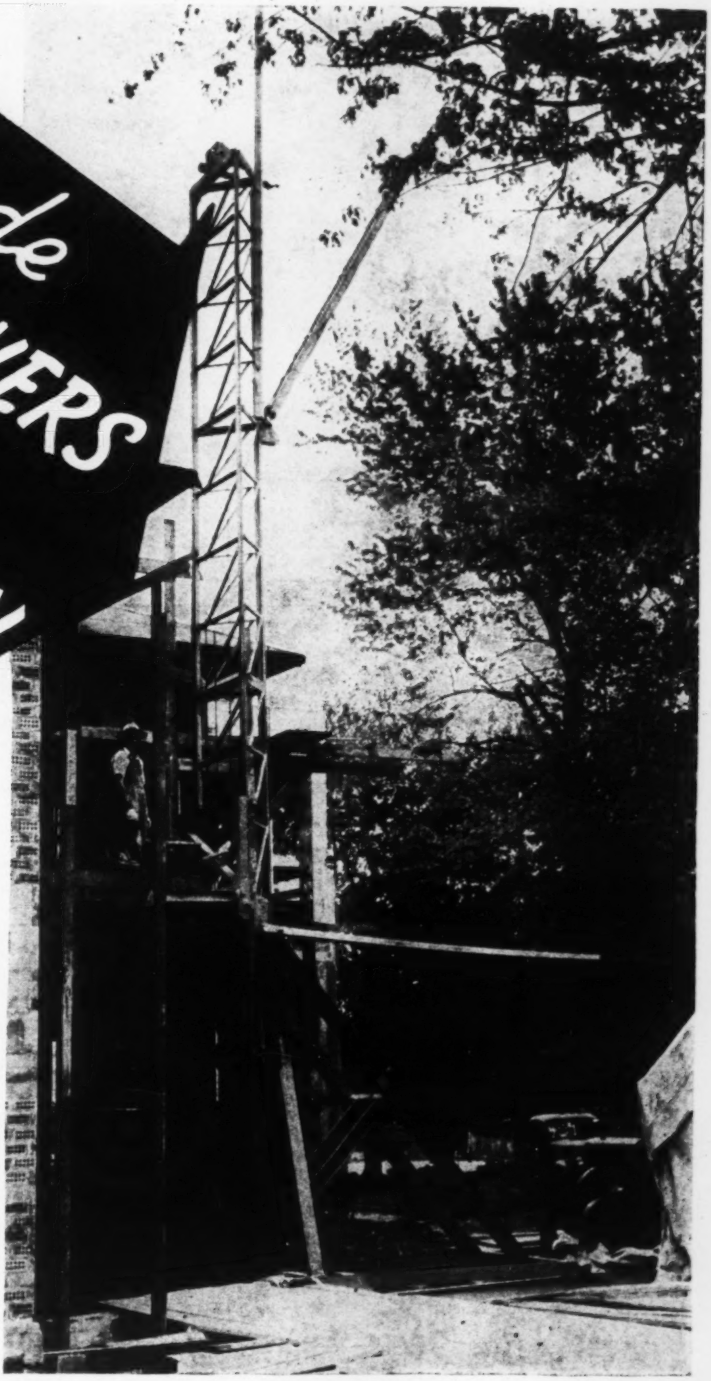
Miles was cited for his skillful preparation of designs, plans, layouts and specifications for construction, assuring timely completion of facilities for the movement of communications zone headquarters to the continent.

Joseph T. Person of Portsmouth, Va., who has been in ship construction at Norfolk, Va., and Panama, has been made general superintendent of construction for a New Bern, N. C., boat building firm.

Walter F. Howard, Wilmington, Del., has been appointed expediter in the Wilmington area for the National Housing Agency. A licensed general construction contractor, he succeeds Francis E. B. McCann, who resigned. Mr. Howard was in the general contracting business in Wilmington from 1925 to 1942. He worked for the War Department from May, 1944, until June, 1945, and since the latter date he has been with the War Assets Administration, where he served as branch chief.

Frank J. Brince, former city engineer of Eveleth, Minn., is now city engineer of Fairmont.

Clyde BUILDERS TOWERS CUT CONSTRUCTION COSTS!



Put a Clyde Builders Tower to work on your next job and you'll save both time and money.

There will be no delays in handling your materials . . . no costly scaffolds to build. Clyde Builders Towers are simple and fast to erect and just as easy to take down.

The tower is assembled on the ground . . . no erection hazards . . . and raised in one piece to its operating position. For short moves around the job or for storage, the tower folds back upon its frame.

With typical Clyde quality materials and design and a Clyde hoist furnishing the power, you're assured of safe, efficient and economical operation.

Four tower heights—36 ft., 46 ft., 56 ft. and 66 ft. Write for descriptive literature

The Clyde Line of Dependable Equipment

HOISTS . . . DERRICKS . . . WHIRLEYS . . . CAR PULLERS . . . HAND POWERS . . . MINE HOISTS . . . PILE DRIVERS . . . DREDGE AND DOCK EQUIPMENT . . . DECK MACHINERY . . . BUILDERS TOWERS . . . LOGGING MACHINERY . . . TANDEM ROLLERS

CLYDE

CLYDE IRON WORKS, Inc.

Duluth 1, Minnesota

TERMITE EGGS
TERMITE EGGS
Queen Termite

IF SHE WERE QUEEN FOR A DAY...

THERE would be thousands of new termites to do their destructive eating if this Queen had her way! The Queen termite lays over 7000 eggs a day!

But termites can't be dangerous when wood has been pressure-impregnated with Du Pont Chromated Zinc Chloride. "CZC"-treated wood is unattractive to termites—fends off their destructive invasions.

"CZC"-treated wood has all the natural advantages of untreated wood plus many others. It not only resists termites, but also prevents decay, retards fire. It is odorless, paintable, clean and easy to handle.

You can give your structures additional safety, long life, and low maintenance cost by specifying "CZC"-treated wood. Find out about this wood preservative that makes wood last longer. Write E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Wilmington 98, Delaware.

DU PONT CZC

Chromated Zinc Chloride

MAKES WOOD RESIST DECAY • REPEL TERMITES • RETARD FIRE

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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

USE THE
finest!
UNIVERSAL
LEVEL-TRANSIT
Price $150.00
DAVID WHITE COMPANY

Elections and Activities

Former members of the Engineer Amphibian Command recently organized a local chapter known as The Greater New York Beachhead and applied to The National Beachhead in Washington, D. C., for their charter. These Army Engineer Amphibians of World War II are organizing to perpetuate the ideals, fellowships and associations that bound them together during the war.

Formed in June, 1942 as an engineer force to specialize in amphibious operations acting as the link between the Army and theNavy, they were formed at Camp Edwards, Mass. Recruited from every branch of the Army and reinforced by many boatmen from the Eastern Seaboard and from the Great Lakes, the Army Amphibs formed teams of boat engineers and shore engineers to capture, organize and defend the newly won beachheads.

In the European Theater they distinguished themselves in all amphibious landings from the first one at Oran in North Africa to include the Normandy landings. Some of their boatmen went on to help in the crossing of the Rhine. Three of their brigades operated the critical Utah and Omaha Beaches where the U. S. troops landed in Normandy.

In the Western Pacific, the 2d, 3d and 4th Brigades and later the 1st Brigade from the European Theater all participated in MacArthur's amphibious operations from the initial combat landing at Nassau Bay in New Guinea in June 1943 to the final landings in Korea and Japan.

Robert L. Weil, 42 East 52d Street, New York City, has been elected secretary and is anxious to contact former members who wish to join the local beachhead. Col. W. F. Heavey, 120 Wall Street, New York, is the Beachmaster. Robert Ingersoll, Editor of PM, is the Shore Party Commander. Howard F. Anderson is treasurer.

C. F. Langworthy, Atascadero, Calif., has been elected president of a newly-formed California State Council of the Engineers and Architects Association. The new group was set up by governing boards of the San Luis Obispo, San Francisco Bay area, Los Angeles state employees and San Joaquin chapters of the association. C. T. Ledden, San Mateo, was chosen vice-chairman and G. E. Ott, San Luis Obispo, was voted secretary.

Why a B-G Bucket Loader Produces Profit the Year Around

"Versatility" best describes the Barber-Greene Bucket Loader—versatility not only in materials it can handle, but in handling these materials throughout the year.

In the spring, the B-G Bucket Loader is used in conjunction with a blade grader and truck for shoulder clean-up, curve widening, contouring, etc. In the summer, it handles aggregates for asphalt patching, street graveling, etc. In the fall, as winter approaches, it is ideal for handling cinders and sand.

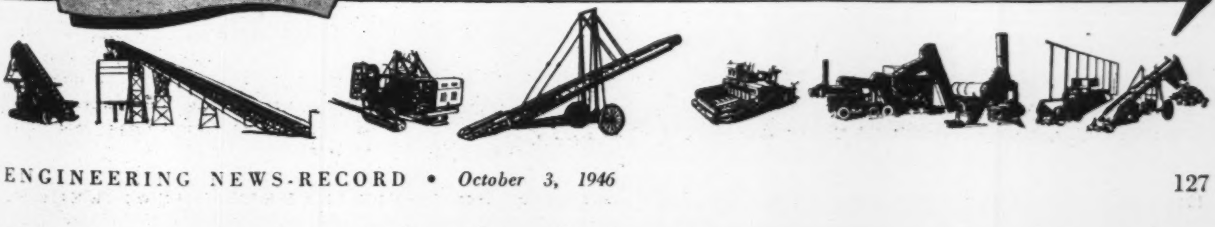
In the winter, when conditions are really tough, the Barber-Greene Bucket Loader can be relied upon to dig into frozen stock piles, break up the lumps, and load the distributing trucks for prompt action in meeting icy conditions.

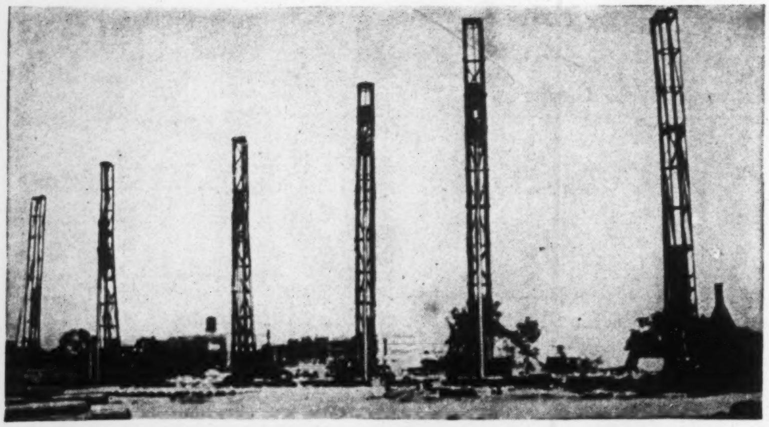
Barber-Greene Bucket Loaders are built in a number of sizes and models. The Barber-Greene Bucket Loader Catalog No. 82 describes and illustrates the various loaders. Barber-Greene Company, Aurora, Illinois, U.S.A.

B G Barber-Greene

46-24

CONSTANT FLOW EQUIPMENT





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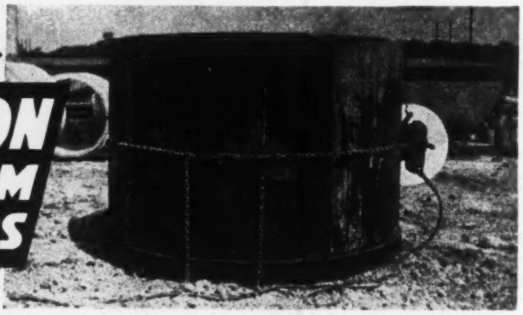
Write for new catalog

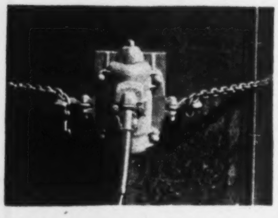


Use JACKSON PIPE FORM VIBRATORS for

Concrete Pipe of HIGH STRENGTH, Great Density, Good Appearance - LOW COST

JACKSON Vibratory Concrete Pipe Vibrators enable their users to fully meet the increasingly exacting specifications for impermeability and compressive strength; to produce stronger concrete with less cement (as less water is used). Slumps of 1" and lower are readily placed. Spading or puddling costs are greatly reduced. Forms can be stripped earlier and reinforcing steel accurately held in position. Finest pipe can be made adjacent to pipe line construction effecting important savings in transportation costs. Recommendations for practicing the VIBRO-CAST method with JACKSON Pipe Machines are yours for the asking.

Internal and external vibrators for all types of concrete construction.



The Improved, Heavy Duty Model PTV-21A — for use on pipe forms from 36" to 120" diameters, 110-130 volt or 220 volt, 3 phase, 50-75 cycle, 3000 to 4800 V.P.M. Other models for smaller pipe.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

Reports and Pamphlets

(Continued from page 96)

TAR STABILIZED ROADS—Report of the Committee on Tar Stabilized Roads. Technical Bulletin No. 104, American Road Builders Association, 1319 F St., Washington, D. C.

FUNDAMENTAL CONSIDERATIONS IN DESIGNING AIRPORTS AND METHODS AND EQUIPMENT USED IN BUILDING RIGID AND FLEXIBLE AIRFIELD PAVEMENTS—Technical Bulletin No. 102. American Road Builders Association, 1319 F. St., Washington, D. C.

BUILDING CONSTRUCTION COST DATA—1946—By Robert S. Means, P. O. Box 62, Duxbury, Mass. $1.60.

PROTRACTORS FOR THE COMPUTATION OF DAYLIGHT FACTORS—By A. F. Dufton. Building Research Paper No. 28. H. M. Stationery Office, London. 4d.

SWIMMING POOL OPERATION—Education Health Circular No. 125. Division of Sanitary Engineering, State of Illinois, Department of Health, Springfield, Ill.

PANELAIRE—The Warm Air Panel Heating System. By H. F. Randolph. Sheet Metal Publication Co., 45 W. 45 St., New York 19. $1.00.

CHEAPER TRANSPORTATION VIA THE TENNESSEE RIVER—Commerce Department, River Transportation Division, Tennessee Valley Authority, Knoxville, Tenn.

HIGHWAY CONSTRUCTION AND OUR NATIONAL ECONOMY—By Charles M. Upham. American Road Builders' Association, 1319 F Street, N.W., Washington 4, D. C.

ROAD SAFETY—By Reginald A. Ryves. The Technical Publishing Co., Ltd., 8 Breams Buildings, London, E. C.4. Price 1s.

WATER LEVELS AND ARTESIAN PRESSURE IN OBSERVATION WELLS IN THE UNITED STATES IN 1943—By O. E. Meinzer and L. K. Wenzel. Part 3. North-Central States. Part 4. South-Central States. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 35c. and 55c. respectively.

ECONOMIC AND HOUSING SURVEY OF THE ORLANDO METROPOLITAN REGION—By Homer Hoyt. Greater Orlando Chamber of Commerce, Orlando, Fla.

YOUR NEW YORK STATE TOMORROW—State Commission for Postwar Public Works Planning. State Office Building, Albany 1, N. Y.

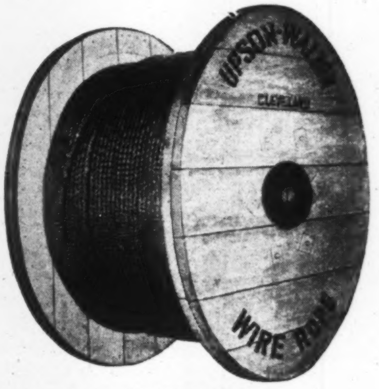
ELEMENTS OF HIGHWAY LAND ACQUISITION PLATS AND RECORDS—By David R. Levin. Public Roads Administration, Federal Works Agency, Washington, D. C.

HIDDEN HAZARDS—How to avoid them when you remodel or build your home. Insurance Company of North America, 1600 Arch Street, Philadelphia 1, Pa.

WE CAN FILL YOUR ORDERS

Deliveries are reasonably good on all items illustrated; in many cases we can ship from stock, in others within 30 to 90 days. Specify Upson-Walton for good delivery, good service, good quality. Ask your jobber.

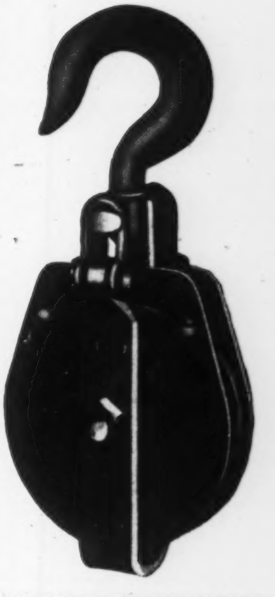
DIAMOND FRAME WIRE ROPE BLOCKS



WIRE ROPE

HOIST HOOKS

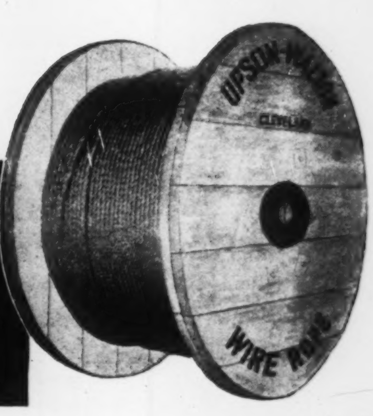
WIRE ROPE THIMBLES



WIRE ROPE SNATCH BLOCKS

U-W

Established 1871



THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks

MAIN OFFICES AND FACTORY: CLEVELAND 13, OHIO

114 Broad Street
New York 4

737 W. Van Buren Street
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241 Oliver Building
Pittsburgh 22

Here's

POWER

..Enough to do most jobs

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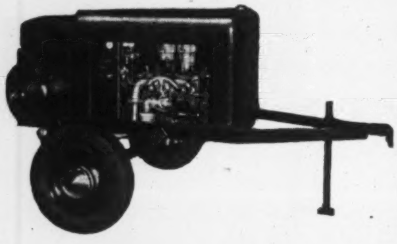
ECONOMY



The Smith Air Compressor

Why pay for needless power with oversize, expensive compressors? A lightweight Smith Compressor will do the majority of your compressor work—at less cost. Use it to run medium weight rock drills, paving breakers, clay spades, large spray guns. Capacity 60 cu. ft.—easily varied for different jobs.

Uses only 1 gal. of gas an hour. Automatic unloading and idling; self-starting. No couplings, belts, clutches or gears. Tow it at truck speeds from job to job. Ford motor and standard parts insure ready servicing anywhere.

Why not get all the facts about Smith Air Compressors? Write, phone or wire today.

GORDON Smith & CO. Incorporated

430 College St. Bowling Green, Ky.

Manufacturers' Activities

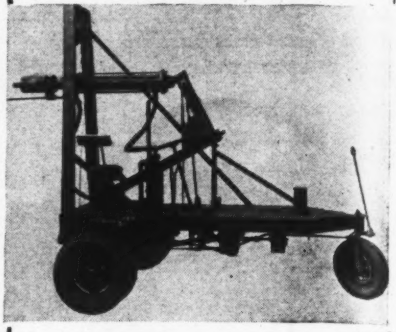
LIDGERWOOD MANUFACTURING CO. has sold its property at Elizabeth, N. J., and is reorganizing its manufacturing facilities, concentrating its heavy manufacturing and its medium and light lines in its other plants, principally those at Superior, Wis., and Beacon, N. Y., where facilities will be enlarged. The program will result in increased efficiency and economy of operation, and will afford more convenient shipping points. New executive offices are at 7 Dey St., New York City. Under the name of Superior-Lidgerwood-Mundy, the company has had 206 years of accumulated experience in design and manufacture of hoists, conveying devices and marine equipment.

WALKER PROCESS EQUIPMENT INC., a newly-organized corporation with headquarters at Aurora, Ill., has recently been formed by J. D. Walker, president. Already in active operation, the company is supplying equipment for water treatment, liquid processes, liquid conditioning and sewage and waste treatment for industrial and municipal users. Associated with Mr. Walker are A. W. Nelson, Douglas E. Dreier, Chester A. Obma, John R. Sperry and Frank Voris.

GARLINGHOUSE BROTHERS, construction and industrial equipment distributors and manufacturers, of Los Angeles, have recently divided the organization into three companies. Garlinghouse Brothers, Distributors, will continue as distributors for nationally known equipment manufacturers. The Gar-Bro Manufacturing Co. will continue to produce a complete line of concrete placing equipment; and the Gar-Bro Wheel Co. will manufacture a line of industrial and agricultural pressed steel wheels. All three will operate under the parent control of the original organization.

DUPONT COMPANY has announced the retirement of Everett G. Ackart, chief engineer, and the appointment of Granville M. Read to succeed him. Mr. Read has been assistant chief engineer

RAPID!

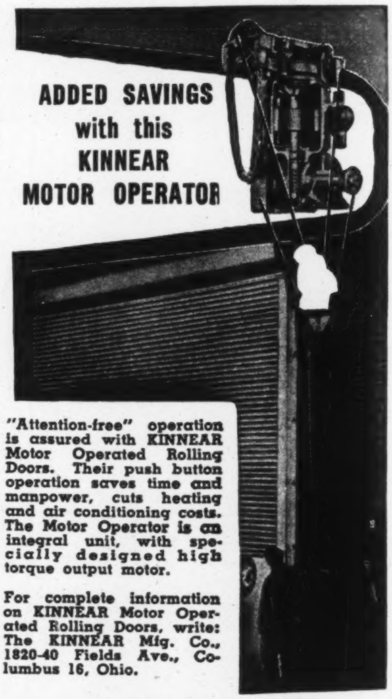


Power—Speed—Economy

- Cuts cost to a minimum
- Works Vertically or Horizontally
- For inside or outside jobs
- Increases your compressor yardage output many times
- Requires only one man to operate

Ask about our Heavy Duty Type

RAPID PAVEMENT BREAKER CO.
1517 SANTA FE AVENUE
LOS ANGELES 21, CALIFORNIA

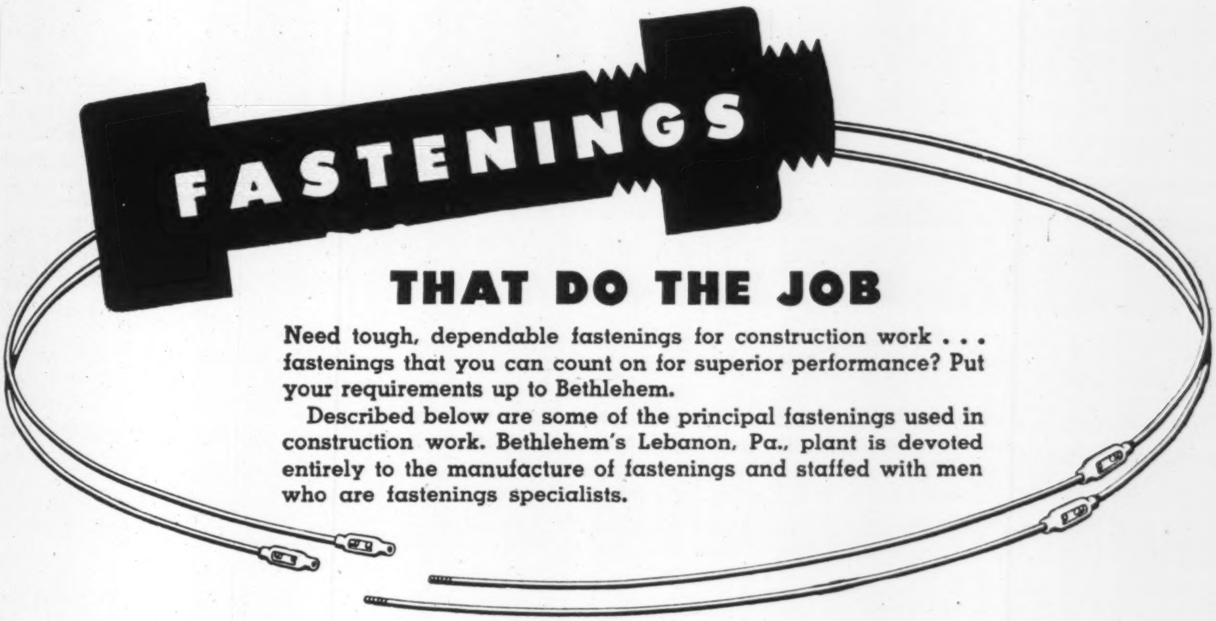


ADDED SAVINGS with this KINNEAR MOTOR OPERATOR

"Attention-free" operation is assured with KINNEAR Motor Operated Rolling Doors. Their push button operation saves time and manpower, cuts heating and air conditioning costs. The Motor Operator is an integral unit, with specially designed high torque output motor.

For complete information on KINNEAR Motor Operated Rolling Doors, write: The KINNEAR Mfg. Co., 1820-40 Fields Ave., Columbus 16, Ohio.

KINNEAR ROLLING DOORS



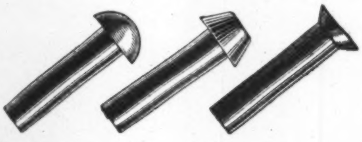
THAT DO THE JOB

Need tough, dependable fastenings for construction work . . . fastenings that you can count on for superior performance? Put your requirements up to Bethlehem.

Described below are some of the principal fastenings used in construction work. Bethlehem's Lebanon, Pa., plant is devoted entirely to the manufacture of fastenings and staffed with men who are fastenings specialists.

TIE-RODS

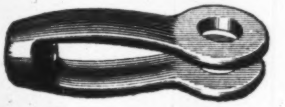
Furnished plain or upset, in single or multiple units, with either cut or rolled right- or left-hand threads. Come in sizes for every requirement. Single-unit tie-rods are normally furnished in lengths up to 46 ft. Multiple-unit tie-rods are supplied in any length. Bethlehem also supplies a full line of tank- and pipe-bands.



RIVETS

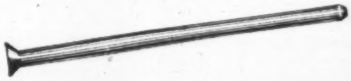
Small Rivets: 7/16 in. and smaller, lengths 6 in. and shorter, with Button, Cone, Countersunk, Pan and Flat Heads.

Large Rivets: From 1/2 in. to 1 3/4 in., inclusive, lengths from 2 in., in steps of 1/8 in. Furnished with Swell Neck, or with Button, High Button, Countersunk, Round-Top Countersunk, Cone and Pan Heads.



CLEVISES

Furnished in all sizes, threaded to American Standard Coarse-thread Series, Class 2. Supplied with either right- or left-hand threads, with or without pin and cotter.

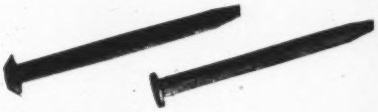


DRIFT BOLTS

Although usually round, Bethlehem drift bolts can also be supplied with square sections. Furnished in following styles:

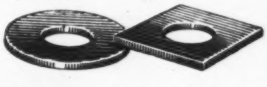
Heads: Button, Countersunk, Square and Headless

Points: Wedge, Half or Semi-Cone, Full Cone, No Point



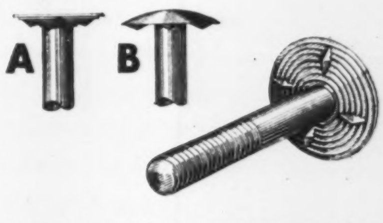
SPIKES

Have wedge points for easy driving, and a scaled corrosion-resistant surface. Furnished with Diamond, Button, Nail, Countersunk and Hook Heads.



WASHERS

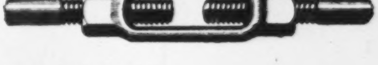
Round, square or rectangular. Round washers are made in two styles: standard and dock. Square and rectangular washers are made to order.



PLYWOOD AND TIMBER BOLTS

Plywood Bolt (A) provides 50 per cent more bearing surface under the head than a carriage bolt of equal size. It retards dry rot, and the flat head provides a flush surface which cannot damage the wood.

Timber Bolt (B) is economical because it eliminates one washer and counterboring. Retards dry rot, and will not turn in timber.



TURNBUCKLES

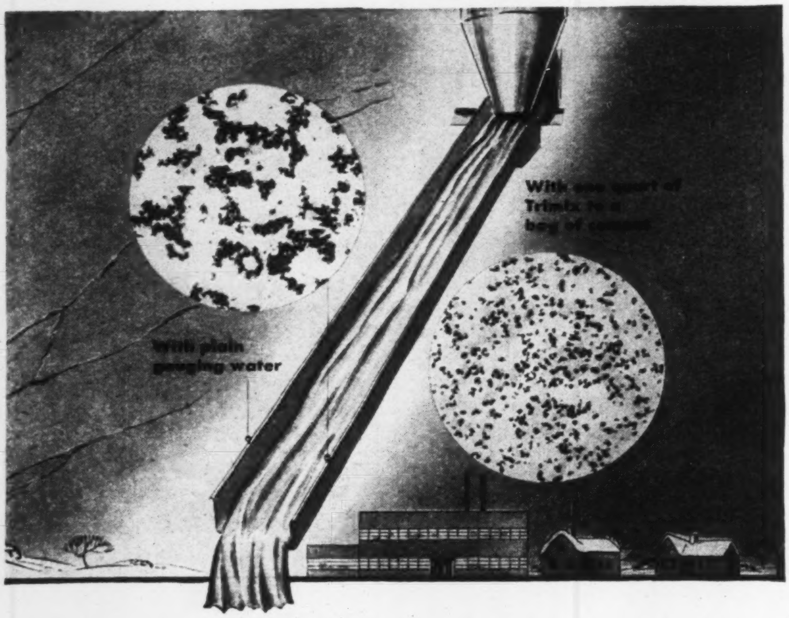
Made in a complete range of sizes, with standard 6-in. openings between heads. Can also be furnished with 12-in. openings.

BETHLEHEM STEEL COMPANY
Bethlehem, Pa.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

Bethlehem supplies every type of Fastening

BETHLEHEM
STEEL


With one quart of Trimix to a bag of cement
With plain gauging water

Better concrete because of better dispersion with TRIMIX

THE MULTI-PURPOSE INTEGRAL LIQUID ADMIXTURE

The magnified photographs show why TRIMIX improves workability of cement and mortar mixes with lower water-cement ratio – 20% less than the usual volume of gauging water required for normal slump.

A patented surface-active agent enables TRIMIX to wet and scatter the particles without interfering with the hydration reaction of the cement.

TRIMIX accelerates set . . . also has air-entraining properties, helping concrete to resist effects of freezing and thawing.

See SWEET'S for further information, and for descriptive literature write Dept. E-10.

SONNEBORN
"BUILDING SAVERS"
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Floor Treatments • Waxes • Paints and Protective Coatings • Concrete and Mortar Admixtures • Waterproofing and Dampproofing • Caulking Compounds
Roof Coatings

IF IT'S
WORTH BUILDING
IT'S
WORTH SAVING

Building Products Division, L. SONNEBORN SONS, INC., New York 16, N. Y.
In the Southwest: Sonneborn Bros., Dallas 1, Texas

of the company since 1943. Mr. Ackart, who climaxed his career by supervising the design and construction of more than a billion dollars' worth of war plants which DuPont built and operated at the government's request, has been with the company almost 40 years.

Melvin F. Wood, who has been manager of the design division of the Engineering Department since 1945 and has been with DuPont since 1928 becomes assistant chief engineer.

The Rockwell Manufacturing Co., Pittsburgh, Pa., has established a new hydraulics division, to specialize in the development of hydraulic equipment. W. H. Marsh will be general manager of the division. He joined the Pittsburgh Equitable Meter Division of Rockwell Manufacturing Co. in 1934.

Announcement has been made by **Infilco, Inc.**, of the appointment of A. A. Kalinske to the post of chief hydraulic engineer. To this position Mr. Kalinske brings a background of highly specialized experience covering nine years of university teaching, research and consultation.

Irwin McNiece has been named assistant district superintendent of service and erection for the Los Angeles district of the Allis-Chalmers Mfg. Co., Milwaukee, Wis. He joined Allis-Chalmers in 1912, working in its service and erection department and as a special representative for the company's hydraulic department out of Salt Lake City.

Manufacture of the FWD model M10, which was virtually out of production during the war, is being resumed, according to officials of The Four Wheel Drive Auto Co. The 12-ton model will meet the need of highway departments in the snowbelt for a truck with the "drift-busting" qualities of the prewar M10 snow removal truck.

C.I.T. Corp., specialist in industrial financing, announces the opening of a regional office in Atlanta at 223 Peachtree St., N. E., under the management of Edward H. Mayer, assistant vice president.

Quality Materials Co., 344 Delaware Ave., Buffalo, N. Y., has been appointed general distributor for The Johnson-March Corp. construction products—specialized waterproofing compounds, concrete additives, and curing

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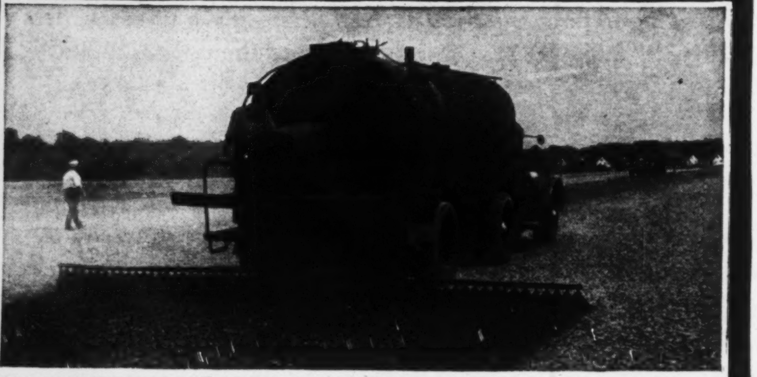

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compounds—for the middle west, north-eastern and New England states.

LeRoi Co., Milwaukee, has announced that its Birmingham, Ala., office has been expanded to full factory branch. A new building at 631 Ninth St., North, has been completed to house service and sales facilities for the southeastern states.

Le Roi Company, Cleveland Division, announces removal of its general offices and engineering department to the main plant, 12500 Berea Road, Cleveland 11, Ohio.

Capt. Rodney F. Coltart, recently released from the U. S. Army Sanitary Corps., has returned to Link-Belt Co. as engineer for the Sanitary Engineering Division in eastern sales territory.

A. M. Byers Co. has announced the appointment of George B. Coffey as manager of the firm's Chicago division, with offices in the Conway Building. Mr. Coffey succeeds W. A. Taylor, who has resigned to enter private business.

D. E. Fricker has returned to Le Roi Co., Milwaukee 14, Wis., as assistant to the advertising manager, to handle sales promotion work and trade shows.

The Board of Directors of Industrial Brownhoist Corp. announces the retirement of James B. Hayden as vice-president in charge of sales and the election of Max Riebenack III to this position. The following changes in the sales organization were also announced: H. D. Wright, director of sales, Eastern Seaboard, New York City; C. H. White, director of sales, South and Western U. S., Chicago; James A. Peppard, district sales manager, Central region, Cleveland; A. P. Lyvers, district sales manager, Chicago; Stanley See, district sales manager, Philadelphia.

G. A. Sabin, director of advertising, The Colorado Fuel and Iron Corp., has announced the appointment of Sidney E. McCrum as advertising manager of Wickwire Spencer Steel Division.

Ash Grove Lime & Portland Cement Co., 101 West Eleventh St., Kansas City, Mo., announces the appointment of Purd B. Wright, Jr., as sales manager, Kansas City office.

New president of National Clay Pipe Manufacturers, Inc., is Eugene K. Sheffield, president and general manager of The Logan Clay Products Co. of Logan, Ohio, and of the New Straitsville, Ohio, Brick Co., succeeding Edward F. Clemens, of the Cannelton Sewer Pipe Co.

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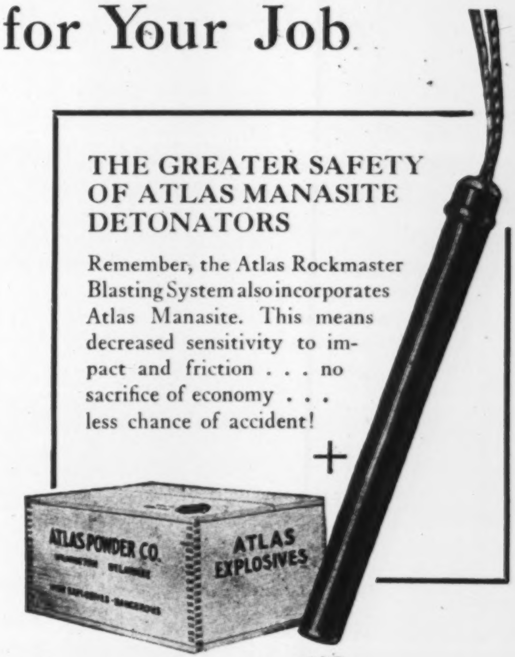

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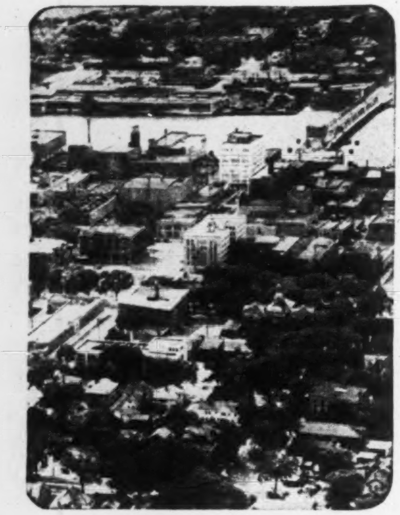

GREEN BAY, WIS. GAVE LAYNE A BIG OK

Green Bay with her progressive business leaders, expanding population and rapidly growing industries has given a big OK to Layne Well Water Systems. With only one minor exception, all water producing equipment for the city bears the famous and always dependable name of Layne. That same foresighted preference which guided city officials was also true with her industries—Warehouse and Cold Storage Plants, Paper Mills, Public Service Companies, Breweries, Creameries, Milk Plants, Laundries, Soap Manufacturers, Food Processing Plants, Religious Charities, County Institutions, and many others.

The choice of Layne Well Water Systems was based upon proven performance and a definite knowledge of low operation cost. But in and near Green Bay, as elsewhere, Layne sturdy quality was not an overlooked factor.

Layne high efficiency Well Water Systems are precision built to very rigid standards of excellence. They embody the finest engineering features yet developed. For further convincing facts about Layne Well Water Systems and Layne high efficiency Vertical Turbine Pumps, write for literature. Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

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Layne Vertical Turbine pumps are available in sizes to produce from 40 to 16.000 gallons of water per minute. High efficiency saves hundreds of dollars on power cost per year.

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WELL WATER SYSTEMS
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Manufacturers' Publications

Fire-tube Boilers—A bulletin covers a line of full-length and submerged fire-tube boilers ranging in capacity from 3 to 110 h.p. They may be manually or mechanically fired, and are particularly adapted for installations where space limitation, portability, and price are controlling factors. They are used for steam generation in manufacturing and processing establishments; on construction jobs; on dredges, derricks, dolly engines, and boats.—*The Brownell Co., 426 N. Findlay St., Dayton 1, Ohio.*

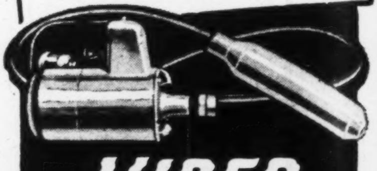
Radiant Heating—A non technical booklet discusses the history and development of radiant heating and enumerates some of the advantages claimed for this system in modern construction. Numerous examples of successful installations of all types, employing copper tube with soldered fittings, are illustrated.—*Copper & Brass Research Association, 420 Lexington Ave., New York.*

Washers and Classifiers—A 28-page book pictures and describes sand, gravel and ore washing and classifying equipment. It tells of log and screw washers, fine material washers, dehydrators and classifiers, shale removers, sand tanks and special equipment. Typical installations are illustrated. Specifications are included, and an information blank to enable engineers to recommend the proper unit for specific conditions.—*Eagle Iron Works, 129 Holcomb Avenue, Des Moines, Iowa.*

Water Proofings—A specification book is divided into three sections: waterproofings, including integral waterproofing and iron water proofing; dampproofings, including clear and bituminous dampproofings; and a miscellaneous section, dealing with the transparent membrane method for curing concrete, swimming pool coatings, paint for damp walls, shrink proof mortar, admixture for bedding machinery, etc.—*Truscon Laboratories, Inc., Caniff & Grand Trunk R. R., Detroit 11, Mich.*

Petroleum Asphalt — (12-p. article) June issue of "Lubrication" highlights story of asphalt, its origin, its place as component of petroleum oil, how ancient civilization made use of it, and how it is used today. Copies are available for free distribution.—*The Texas Co.,* 135 *E. 42nd St., New York* 17, *N. Y.*

Grapple Devices — (Illustrated bulletin) Contains ideas for handling such



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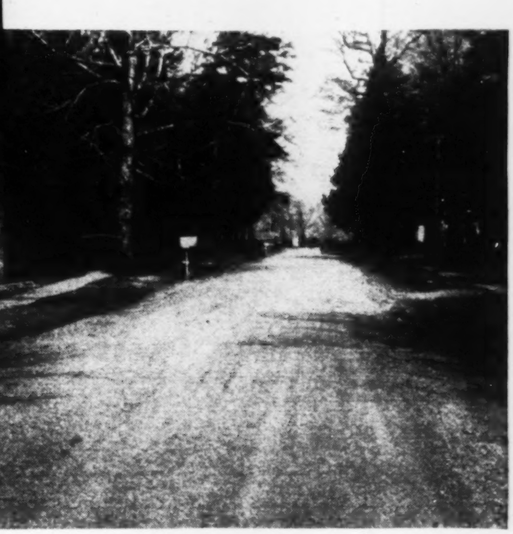

Typical light-traffic street of soil-cement base in the Lakewood Subdivision, Erie County, Pennsylvania.
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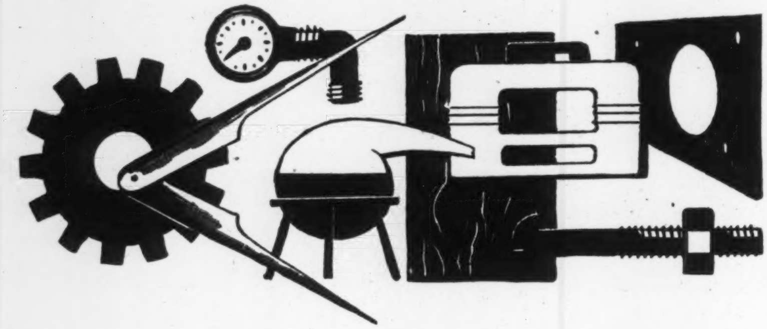

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materials as pulpwood, rock, scrap iron and heavy trash, as well as helpful information on all company's grapple devices for many special services.—*Hayward Co., 50 Church St., New York 7, N. Y.*

Fluid Measurement—(151-p. handbook) Covers principles of orifice meter measurement; orifice plate and differential connections; design details of Brown flow meters, flow approximation tables; derivations of working formulas; working equations; compressibility of gases; relationship between coefficient of discharge; viscosity of fluids; orifice calculations for steam, water, oil and gas flow. Final chapters give summary of equations and nomenclature, changes for corrections in operating conditions and volume computations. It includes 38 figures and 55 tables. Titled "Flow Meter Engineering Handbook", it is compiled and edited by Louis Gess and R. D. Irwin. It is priced at $2.50—*Brown Instrument Co., Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.*

Gas Holders—(30-p. bulletin) Covers details and engineering data on Stacey-Klonne dry seal gas holders. Construction pictures are supplemented by drawings of cross sections and general dimensions and foundation data. Holder requires no water tank.—*Stacey Brothers Gas Construction Co., Cincinnati 16, Ohio*

Helicoid Gage—A pressure gage with the helicoid movement is explained in a 16-page catalog. The gage is guaranteed accurate to within ½ of 1% of the total dial graduation over the upper 95% of the 280° dial arc. This means that on a 100-lb. dial accuracy is guaranteed to within ½ lb. over the entire scale except from 0 to 5 lbs. A newly designed adjusting mechanism in the rear of the gage makes possible recalibration without removing the pointer and dial or the glass and ring.—*American Chain and Cable Co., Inc., Bridgeport 2, Conn.*

Shot Peening—A booklet covers the use of shot peening for increasing fatigue life of metals. This study, fully illustrated with drawings, charts, and photographic reproductions, gives the application of shot peening to production requirements, and performance data on the practical use of this method in the metal-working fields. Management and plant production men as well as chief engineers and metallurgists will find the book handy for reference.—*Pangborn Corp., Hagerstown, Md.*

Service Entrance Cables—A new 8-page catalog describes the various kinds of service entrance cables approved by

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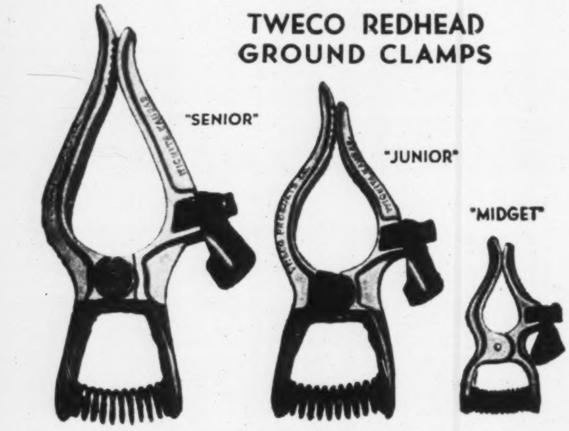

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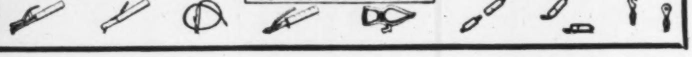

the Underwriters' Laboratories. It also illustrates the way each kind of cable may be used. The description of each type is complete even to the weights per thousand feet of cable, and the physical dimensions.—*Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.*

Diesel Tractor—An illustrated 24-page catalog features a new diesel tractor, which has a General Motors 2 cycle engine, unit injector, transmission construction, and sealed truck wheels, 60 drawbar horsepower, five speed ranges. The engine dimensions, fuel capacities, shipping weights and track design are given.—*Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wis.*

Melting Kettle—A catalog illustrates and describes a new tar, asphalt and pitch melting kettle with instantly removable heating tubes, besides other improvements.—*Hauck Manufacturing Co., 124–136 Tenth St., Brooklyn 15, N. Y.*

Preventing Poisoning—Special issue of "Guide Line", 4-p. folder, offers suggestions to aid construction men in avoiding poison ivy, oak, sumac and snakes during clearing operations. Plants are illustrated and described and detailed preventive action outlined. It also explains how to avoid and deal with snake bites.—*Loss Prevention Dept., Liberty Mutual Insurance Co.,* 175 *Berkeley St., Boston, Mass.*

Wire Rope—"Correct Handling of Wire Rope", 16-p. booklet, is first in series designed to serve as ready reference manuals in office, plant and field. It covers winding, rewinding, and seizing and gives detailed directions for attaching sockets.—*Union Wire Rope Corp.,* 2174 *Manchester Ave., Kansas City* 3, *Mo.*

Pumps—Bulletin D-246, 8 pp., two-color, covers line of SCV pumps. It gives parts list, dimensions and selection tables.—*Economy Pumps, Inc. Hamilton, Ohio.*

Resinous Cement—All-purpose, acid-alkali-proof resinous cement is described in 6-p. folder. Resistivity chart shows immunity to almost all concentrations of commercial acids, alkalies, salts or solvents.—*Nukem Products Corp., Buffalo* 20, *N. Y.*

Perforated Metal Screens—New edition of 52-p. handbook, called Bulletin 70, contains illustrations, data tables, specifications and standard practice information on three types of perforated plate screens—flat, step, conical and cylindrical for concrete aggregates and the like.—*Morrow Mfg. Co., McNally Pittsburg Mfg. Corp., Pittsburg, Kan.*